Engineering News-Record

A Consolidation of Engineering News and Engineering Record
McGRAW-HILL PUBLISHING COMPANY, Inc.
January 17, 1918

JAN 19 1918

Battery of Forms Used in Making Each End of Casting Required to Finish Concrete for Pressure Pipe on Winnipeg Aqueduct.

In This Issue

Stone-Filled Sheet Asp[halt] It Suffers from Inatten[tion] Detail
By CLIFFORD RICHARDSON

Making and Placing Ten Miles of C[oncr]ete Pipe for Winnipeg Aqueduct

Sinking a Fifteen-Pocket Caisson Exactly to Grade

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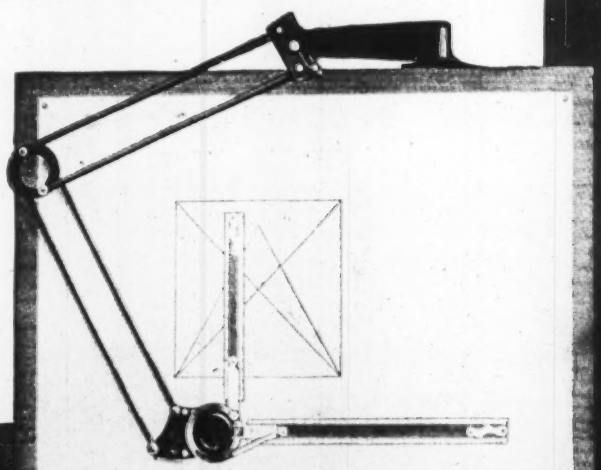

The accompanying view of Stone & Webster drafting room, shows some of the full equipment of Universal Drafting Machines used by this company.

UNIVERSAL DRAFTING MACHINE COMPANY
Cleveland, Ohio, U. S. A.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

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War a Destroyer of Inertia and Prejudice

ONE of the many interesting phenomena of the war is the ready acceptance under its pressure of ideas hitherto making slow progress against inertia and prejudice. For example, far-sighted men have long realized the value of detailed instruction to workers, of a brief but intensive training period, of fitting workers to tasks, of having regard for psychological factors. The application of all these ideas, though, made slow progress. Now at a moment they receive wide acceptance. Necessity has forced action and has forced prejudice aside. The specialized training of war cripples, reported in this journal some weeks ago, and the training of women for industry, discussed on page 69 of the last issue, are instances of the accelerated progress due to the war. In various war industries short training courses—vestibule shops or schools, they have been called—have been established. The methods will undoubtedly persist after the war to the benefit of all concerned—the worker, the public, the industry.

The First Large Concrete Ship

ON PAGE 105 and in the supplement accompanying this issue will be found information relating to the first 5000-ton concrete ship. At present only pictorial description is permissible, but the venture is so novel, the step so great, that these views will hold the greatest interest for engineers and contractors. Particularly will this ship appeal to the readers of this journal, for it is they—the civil engineers and contractors—who have developed the use of reinforced concrete and made possible the achievement represented by the big boat now on the ways at San Francisco. The presentation of these views would not be complete were they not accompanied by a word of appreciation for the courage displayed by the men who initiated and have backed this enterprise. Themselves not shipbuilders, they have stood sponsor for an experiment of exceptional proportions. When they initiated their work, the only precedent was a barge of a few hundred tons capacity. Even now no real concrete ship is afloat, and the nearest competitor on the ways runs to only 1600 tons. To W. Leslie Comyn, president of the San Francisco Shipbuilding Co., chief credit is due. His was the faith that carried the enterprise through the stage of financing, when the project was considered impossible, and his "mud ship" and "brick ship" was made the subject of many a thrust. His faith and courage have continued undiminished despite the trials incident to a revolutionary development. The final stage of the enterprise has not been reached—the service test—but as the ship has grown, the designs become completed, there has been an increased confidence on the part of all—technical advisers, both marine and structural, as well as owners. The engineering public will look on with hope and faith and generous wishes for complete success.

More Water Capacity and Less Water Waste

A SINGLE water-supply conduit from a distant source with only a few days' storage capacity at the city end of the conduit places a city in a condition of constant danger of water famine. The danger increases as the daily consumption approaches the conduit capacity and doubles or trebles at extremes of heat and cold. A case in point was Jersey City during the recent week of zero weather. Luckily no great conflagration broke out, but railway traffic on two important lines was demoralized for several days. Presumably there was also much interference with other industries and with the comfort and convenience if not the health of thousands of citizens. Perhaps the incident will hasten plans already well under way for duplicating the water-supply conduit from the Boonton reservoir to Jersey City. Should it not also lead to an immediate extension of the meter system? Such a course would not only cut waste but would also place its burden on those responsible for it. A drive on water meters, combined with an auxiliary water-supply by contract, just proposed, might enable Jersey City to postpone the duplication of its conduit for several years, thus saving the city excess war prices and releasing funds, material and labor to help win the war.

Ministry of Munitions Is Not Favored by President

THE report, made on high authority, that President Wilson does not favor the establishment at this juncture of a Ministry of Munitions to take over all the work of the purchasing organizations of the War and Navy Departments implies that the readjustments made as a result of recent Congressional investigations are expected to solve the problem. As, in the last analysis, the creation by legislative enactment of a Ministry of Munitions would be equivalent to giving the President an extra cabinet member, it is believed that the objection of the President, who is the one person to be consulted in the matter of adding a new member to his official family, will definitely put an end

to the project. Evidently the recent reorganizations, which include the creation of a war council by the Secretary of War and the calling in of men of large experience and executive ability, such as General Goethals, are relied upon by the President to solve such difficulties as have been brought to light in the recent investigation of various bureaus in the War Department. Of course, no public dissatisfaction has been expressed over the work of the Bureau of Supplies and Accounts in the Navy Department, which is generally credited with having done excellently in providing for the great increases that have taken place in that branch of the service. The manufacturing public can count with confidence, therefore, on the continuance of their existing relations with present purchasing agencies of the Government.

Taking Counsel on Purchasing

IN THE news pages of this issue will be found a Washington report regarding the prospective reorganization of the purchasing methods of the War Department. The problem is so many-sided and will have so important an influence on the army and on the country's industries that the policy to be determined should be given most careful consideration. The Senate Committee on Military Affairs already has much information regarding methods thus far employed. It will get more. It hears, however, from those who have been responsible for the present system. It would be well before the constructive work is undertaken to take counsel of those who have had a broad purchasing experience and who have not been connected hitherto with the war purchasing. General Goethals is among those who should be able to render assistance. The purchasing for the canal was of large proportions and was efficiently handled. The General has had no connection with war purchasing and is now engaged on the task of reorganizing the Quartermaster's Department. In that work the deficiencies of the present system are sure to become clear to him. The Senate committee might well take counsel of General Goethals' experience.

The 10 Per Cent. Profit Specter

IN HIS testimony before the Senate Committee on Military Affairs the Secretary of War stated that the cantonments had been built at a profit to the contractors of 2.98 per cent. The statement should help to lay the specter of "cost plus *10 per cent.*" which still seems to haunt the public in their thinking about the cantonments. It is true that on the small contracts—less than $100,000—the fee was, and still is, 10 per cent. The rate of profit then decreases as the cost of the work increases, 6 per cent. being the return on jobs costing over $3,500,000, with the stipulation that the maximum fee, no matter how large the contract, be not over $250,000. The size of the contracts was such, however, (the sixteen national army cantonments were built at a cost of $134,000,000) that the average profit was brought down to the percentage stated by the Secretary. In one contract, over $3,500,000 but much under the maximum, that has come to this journal's attention, another factor—the war profits tax—has cut in heavily and will bring back to the Government between $100,000 and $130,000 of the $250,000 fee it paid the contractor. Of course there was inefficiency in some of the cantonment construction. That was inevitable, though none the less regretable, under the circumstances. Moreover, the cost plus fixed fee form of contract would avoid the criticism that has been leveled at the cost plus a percentage for profit. Nevertheless, the facts should be recognized—the returns to the contractors were not abnormal, and they did not, as has been baselessly charged, have any interest in promoting inefficiency, whatever may have been the desire of unpatriotic, time-serving foremen and workers under them.

Shipping the Controlling Factor in Our Production Program

VARIOUS efforts are being made to fit labor supply to labor demand. In the enlisted personnel of the army there has been made a census of the men's experience. For other Government operations, public and private, many plans are being used to get the required workers.

Careful canvass of the methods discloses lack not only of comprehension of the problem, but of intelligent methods of labor management. This indictment applies as of the divisions or departments individually and to the war machine as a whole. Each "procurement" division is now a law unto itself. It is intent on its program; it cares not about the troubles of others. The railroads broke down under a priority scheme of this kind: my goods are to be shipped—the devil take care of the rest. Much the same is the situation regarding labor.

If the available labor is to be used intelligently the whole war activity back of the lines must be regarded as *one production program.* The parts must fit into one scheme. There must be coöperation, one centralized intelligence. We do not say centralized control. That is not feasible with the present war machine, nor is it necessary. A centralized intelligence will serve.

Even centralized intelligence will not avail, unless the problem be correctly analyzed. The key to the entire situation is shipping. At present we have not enough carrying capacity to take the goods that the factories are turning out. Mountains of freight are at the seaboard and congestion extends well inland. If we stimulate production still more that condition will become so aggravated that factories will have to go on part time or shut down. That means disorganization of forces recruited at great expense, labor dissatisfaction and probably *serious, very serious trouble.*

Shipping therefore determines the volume of contracts that should be let and the rate at which they should be prosecuted. Volume and rate determine the quantity of labor required.

Manifestly, then, there is needed in each procurement division schedules which show the tonnage to be delivered to seaboard. These division schedules, centralized, make a national schedule, which must be balanced against shipping capacity. If production exceeds shipping, production will be cut down to fit. If cargo space is in excess, production will be increased. Consideration will be given in such a plan to the feasibility of

piling up supplies as against a possible time of cargo capacity greatly in excess of the weekly production.

Schedules being adjusted to shipping, the handling of labor is possible on a sound basis.

Most plants *use* from two to ten times as much labor as they *need*. In other words their labor turnover is from two hundred to one thousand per cent. Their shortage is not in labor but in managerial sense and ability. Their cry for more labor is to be met not with additional workers but with help in management.

In addition, therefore, to offices in each procurement division which will centralize schedules there is need for equally careful record of the labor situation. Schedule and labor officials from each division coming together in a centralizing committee would quickly work out production in a way to use the available labor to the best advantage, insure the use of cargo space as it became available and prevent what is now threatening, even worse seaboard congestion.

The plan is simple. In that lies its merit. It, or some similar comprehensive plan, must prevail, or we shall continue to bungle. Various departments are working on the problem. The Ordnance Department is making good progress on the essential work—production schedules and intelligent labor handling. The Secretary of War is in a position to apply the ideas, through the War Industries Board, to all War Department activities. Once the production and labor features are centralized in the War Department the navy could quickly fit its plans into the general scheme, while the Department of Labor would obviously act as an over all agency and use its administrative machinery as it would prove applicable. The Shipping Board necessarily is a vital factor in the plan. Its place in the scheme is self evident.

Help Save Our Boys—They Must Have Big Guns!

Heavy machine tools must be had at once—in large numbers. There is no time for the Government to have them built. If our boys in France are to get weapons to fight with, we must take these tools from peaceful industries to make the weapons.

The machines needed are:

60 x 60 x 20-ft. planing machines.
48 x 48 x 20-ft. planing machines.
36 x 36 x 14-ft. planing machines.
Nos. 4 and 5 plain milling machines.
Nos. 4 and 5 vertical milling machines.
30-in. x 20-ft. engine lathes.
36-in. x 20-ft. engine lathes.
4- and 5-ft. radial drilling machines.
18 x 130-in. cylindrical grinding machines.
10-ft. vertical boring mills.
5-ft. vertical boring mills.
6-in. floor type, horizontal boring and milling machines.
4-in. floor type, horizontal boring and milling machines.

Are any of these machines in your plant?

If so, arrange to do without them from the earliest possible date—the Government will buy or rent them.

We cannot win the war without big guns. We cannot make the guns without these tools.

Write or wire the

Machine Tool Section
of the
WAR INDUSTRIES BOARD
COUNCIL OF NATIONAL DEFENSE
Washington, D. C., and do it NOW.

Rapid-Transit Developments and Efficiency in the City

PHILADELPHIA'S success in bringing about an operating partnership between the city and the Philadelphia Rapid Transit Co. is but one element, though a significant one, of a general forward movement in rapid-transit matters in our large cities. That such progress should develop at a moment of maximum national strain, at the entrance into the greatest war year ever known, is surprising. But it appears to be, like the developments in the railway situation, the expression of an effort toward increased service efficiency. We have come to realize at last that efficient transit means as much to the city as efficient freight movement means to the nation. Pittsburgh has just made its first serious step toward urgently needed improvement in city transit. After a year's keen study of the problem, engineers report that two rapid-transit lines should be built, linking up the east end, the Allegheny side and the South Hills district with downtown. In Detroit the pressure of rapid growth has led to the same result. A definite plan has been formulated for the first small step in tying together the distant parts of the city by rapid transit, to free its industrial and commercial life of needless lost motion. And at the same moment a very concrete example of progress is exhibited by New York, in the opening last week of the central part of its most important new subway route, the Broadway line.

At the front of present rapid-transit developments, however, stands the Philadelphia partnership agreement. Its importance lies as much in the new spirit that speaks from it as in the novel, precedent-creating terms of the contract. Community of interest between municipality and operator is explicitly recognized.

Embracing all existing street-car and other transit lines and the new lines which the city is constructing, and arranging both financial and management affairs on a remarkably broadgage basis, the agreement accomplishes two great things for the city. First, all present traffic facilities are mobilized for most efficient and lowest-fare operation immediately, and so soon as the nearly-completed Frankford elevated railway is ready for trains a rapid-transit system of considerable scope comes into being by combining it with the old Market Street line. Second and no less important, wounds of long standing are healed and sound guarantees for the future are given to the taxpayer, as well as to the street-railway investor, by a recognition of the company's present capital obligations coupled with an assured but absolutely limited five per cent. return on

this capital. Under control of a supervisory board of engineers, the method of administration enlists all the power of the state public-service commission and adds still further powers of regulation for the purpose of efficient management.

Thus at one stroke a tangled situation that was a threat against efficiency in transportation within the city is cleared up. All parties in interest have joined hands to give Philadelphia the best transit obtainable. With years of discussion and dispute preceding, the chance of agreement seemed remote; the final success may fairly be credited to sober and purposeful recognition of the fact that now performance is needed rather than words.

The past way of dealing with rapid-transit questions was a go-as-you-please method, with much argument and talk, and few immediate results. The demands of the immediate future are for direct and rational attack on the problems that present themselves. Indications are that the public spirit will support such direct procedure, or rather will render any other impossible. And at the same time the Philadelphia contract will help toward solution of rapid-transit problems by showing a way to efficiency through coöperation.

Consulting "Jobs" that Lower Engineering Standards

FIVE positions, those of consulting engineer to each of the five boroughs of New York City, which, both by reason of the title and of the salary—$7200 per annum—should be given only to men of considerable attainments in the civil engineering profession, have assumed the character of out-and-out political appointments. Recent evidence of this is the giving of one of these posts to a man who is scarcely recognized as an engineer of any sort, and whose chief reputation rests upon his having been removed from office for cause shown when he was president of the Borough of the Bronx in Mayor Gaynor's administration. If offices bearing engineering titles are to be created for the purpose of affording plums to political bosses, it is time that engineers should take cognizance of the fact for the protection of the engineer's public reputation. Agitation should be begun either for the abolition of these offices or for the appointment to them of real engineers.

Can the New York Canals Carry All the Coal the State Needs?

IN AN entirely praiseworthy effort to promote the use of the New York State Barge Canal and incidentally to initiate measures toward providing coal for the state next summer, General Wotherspoon, State Superintendent of Public Works, has made public a plea for the utilization for the State canal system as a carrier for coal. The superintendent points out that Ithaca and Watkins Glen, the most southerly terminals on the canal, are within 120 to 190 miles of both the anthracite and the bituminous centers of Pennsylvania, whence comes practically all of New York State's coal supply and that railway transportation of coal to those canal terminals, to be carried to New York centers by water, would release 18,000 cars per month for service to relieve the coal shortage elsewhere in the country, a shortage which even the coming of the warm weather will not end.

General Wotherspoon figures that the canal's capacity is limited only by the quantity of water utilized in operating the locks. On such a basis, he assumes that five 240-ton boats—a tow filling one of the locks—can pass every half hour in the day, or 57,600 tons each day, and upwards of 12,000,000 tons in the canal season. This is about 75% of the total tonnage of coal now entering New York State by rail. The remaining 25%, he concludes, can be brought to other transshipment points on the canal with some saving of rail haulage, though not as great as that effected by using the most southerly ports.

The only factors preventing such a use of the canals are the lack of boats and terminals. Boats for so dense a traffic, which would amount to a continual day and night procession of tows every two miles along the canal, are admittedly not now all available, but the superintendent rightly says the needed additions could be built with little or no delay.

The loading and unloading of the boats, however, is passed over with the casual sentences: "Terminals are available for service at practically every port of the canal system. They have been or will be equipped with devices for the speedy and economical handling of the traffic. If the coal traffic wants special machinery, it can be provided." In so far as the unloading is concerned, this may be true. No one terminal along the canal will have so great an inflow of coal as to preclude the early construction of suitable handling machinery. But to load at one or even at two ports the estimated 1150 cars per day onto barges will require terminals of mammoth proportions, such as can hardly be provided in time to be of aid in the coming crisis. The Curtis Bay terminal of the Baltimore & Ohio R.R., the largest coal-handling plant in the world, can transfer 7000 tons per hour, or less than three times the estimated speed at the canal loading point. And this railroad terminal cost $3,500,000, exclusive of its extensive yard system, and took two years to build.

No one doubts the availability of the New York canals as coal carriers. No one should criticize the state official for promoting that use of the canals. Far too little publicity has been given the canals in the past. But the superintendent has evidently claimed too much for his carrier in this last statement. He has overlooked in his estimate one of the most important, if not the most important factor in the present congestion of our railways; that is, inadequate terminals. Terminal inadequacy will congest a canal just as surely as it will a railway. The picture of a tow of five 240-ton canal boats full of coal leaving Ithaca and Watkins every hour of the day and night from the first of next April to the first of next November is pleasing, and even conceivable; but it is hard for an engineer to visualize, completed in the next few months, the yards required to bring up that much coal through those two narrow lacustrine valleys and deliver it to dumpers where now there exist only typical canal retaining-wall terminals. Part of the railway congestion of the coal-carrying roads through New York State should certainly be relieved by the canals next summer. Taking over the entire New York traffic is a trifle ambitious.

First Large Concrete Ship Is Building at San Francisco

Vessel Will Have Dead-Weight Carrying Capacity of 5000 Tons, Is 366 Feet Long and Has 45-Foot Beam—First Full Publication of Views

(This article is accompanied by a large inserted supplement)

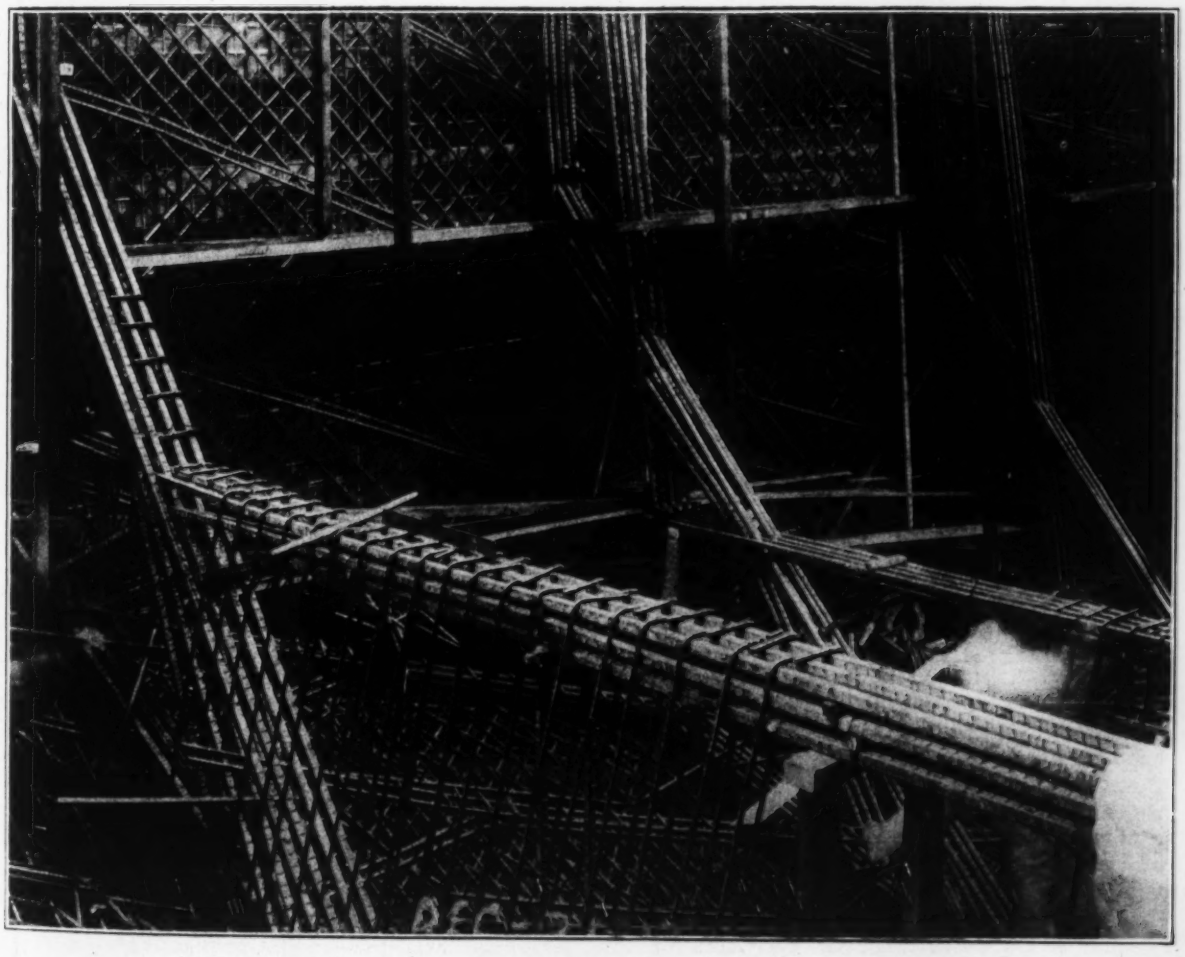
LAST August the San Francisco Shipbuilding Co. began the construction at Redwood City, Calif., at the southern end of San Francisco Bay, of the ways for the construction of a reinforced-concrete ship of 7900 tons displacement, with a dead-weight carrying capacity of 5000 tons. The laying down of the ship was started in September and the vessel will be ready for launching Mar. 1. Had it not been for changes of plans and the employment of a new naval architect, the vessel would likely have been ready for the water Feb. 1. At the present writing, pouring of the concrete in the bottom is under way.

The ship is 336 ft. long over all, 45 ft. in beam, and 31 ft. deep to the upper deck. The draft loaded will be 24 ft. The ship will be equipped with Scotch marine boilers and 1750-hp. triple-expansion engines. The speed will be 10 knots.

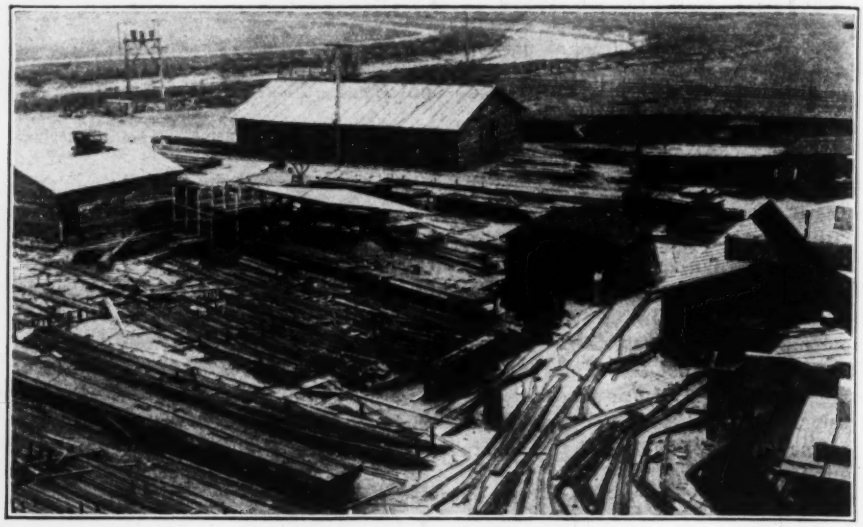
Details of the design of the ship are, for obvious reasons, held confidential for the present, but through the courtesy of W. Leslie Comyn, president of the San Francisco Shipbuilding Co., *Enginering News-Record* is privileged to present here the first adequate pictorial history of the progress of the boat. The general plan of the design is apparent from these illustrations. They give concrete designers and constructors quite a clear idea of the construction problem presented by so complex an engineering structure.

The company now has under way designs for four ships of 7500 tons dead-weight carrying capacity.

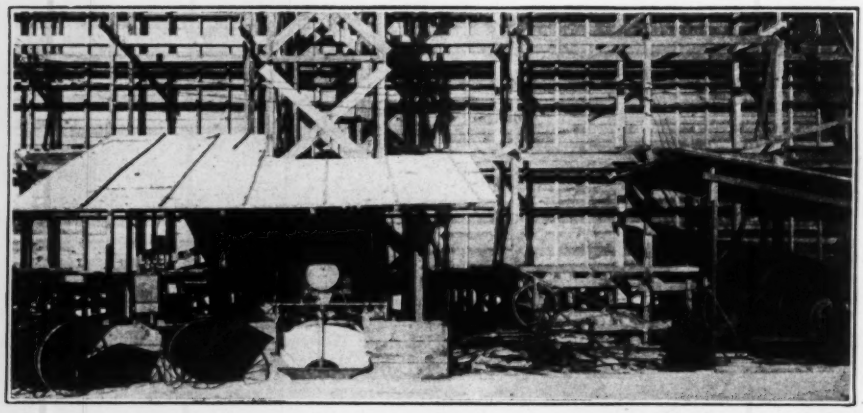
The officers of the company, in addition to Mr. Comyn, are John Lawson, vice-president; George U. Hind, treasurer; R. J. Hanna and J. H. Baxter, directors, all of San Francisco. Allen MacDonald, of MacDonald & Kahn, consulting engineers and contractors, is superintendent of construction; E. L. Stuart, naval architect, and A. Poss, consulting engineer.



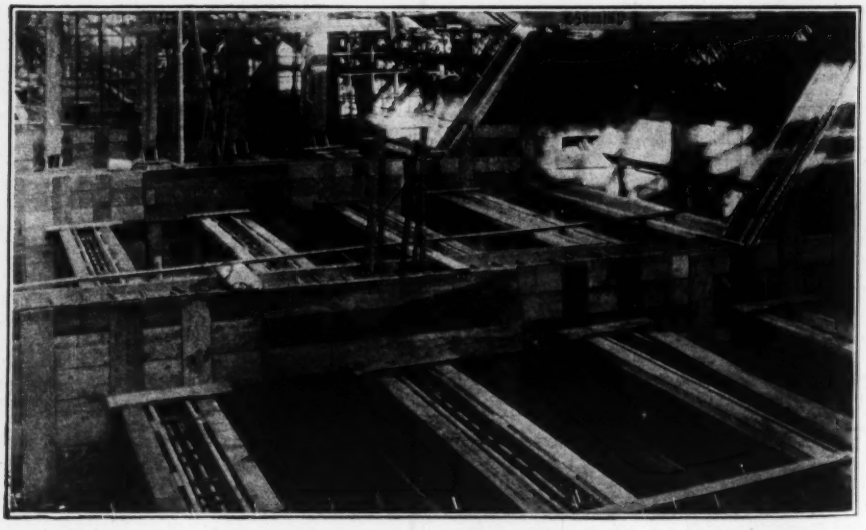
COMPLICATED BIT OF STEELWORK AFT



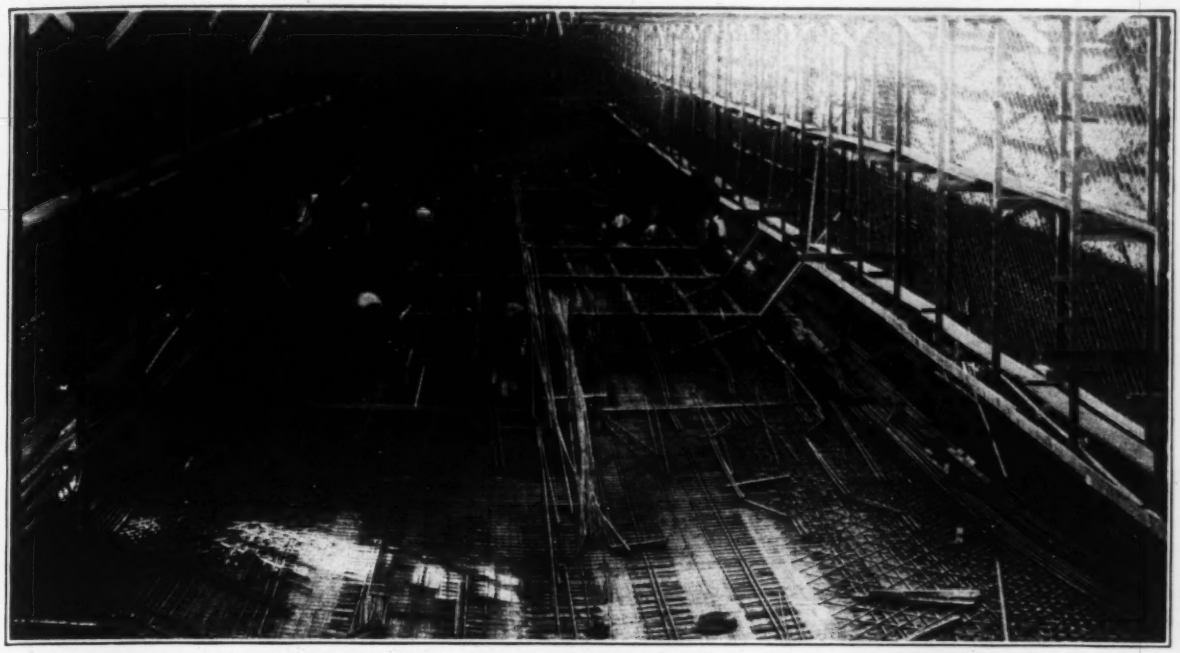
THE TWO UPPER VIEWS ON THIS PAGE SHOW THE WHOLE "PLANT" FOR BUILDING THE CONCRETE SHIP—CONTRAST IT WITH THE LARGE AND EXPENSIVE PLANT REQUIRED IN A STEEL-



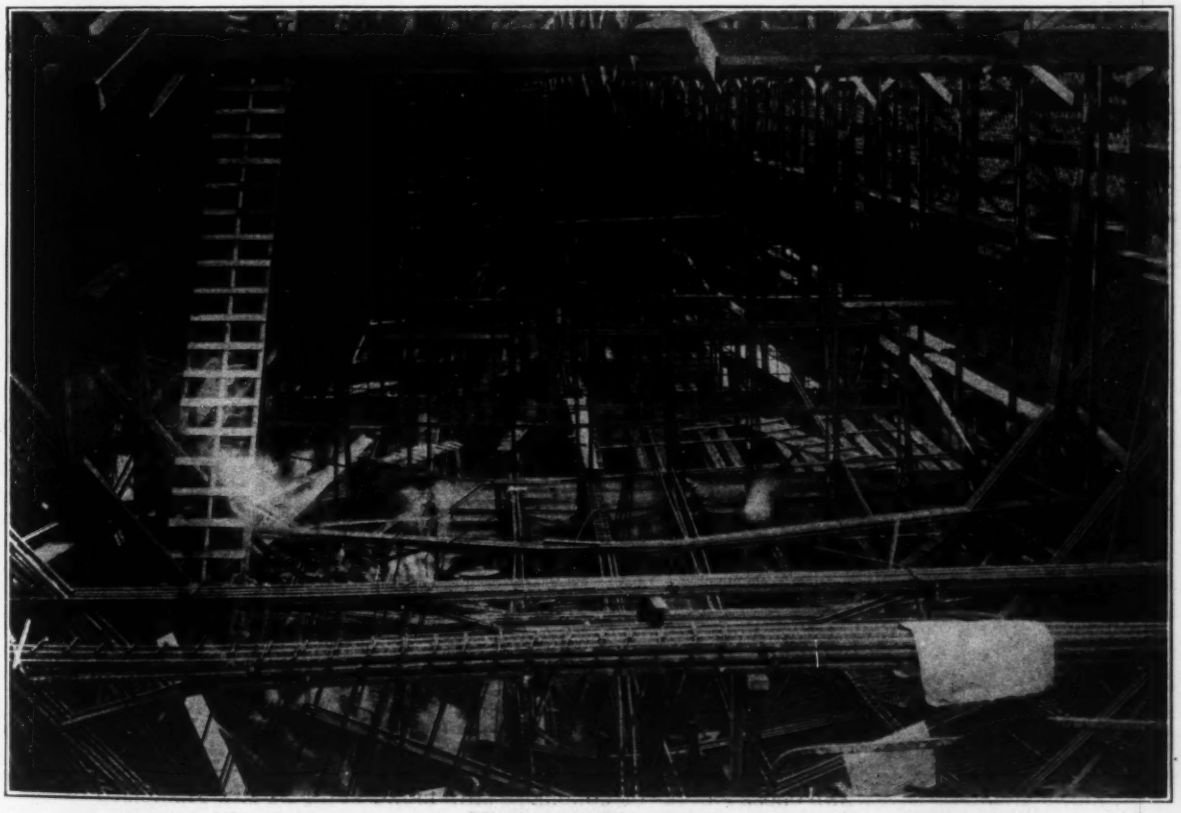
SHIP YARD—FOR THIS FIRST SHIP, NO POWER EQUIPMENT WAS INSTALLED, SAVE FOR THE MIXER AND HOIST—FOR LATER SHIPS ALL POSSIBLE LABOR-SAVING MACHINERY WILL BE EM-



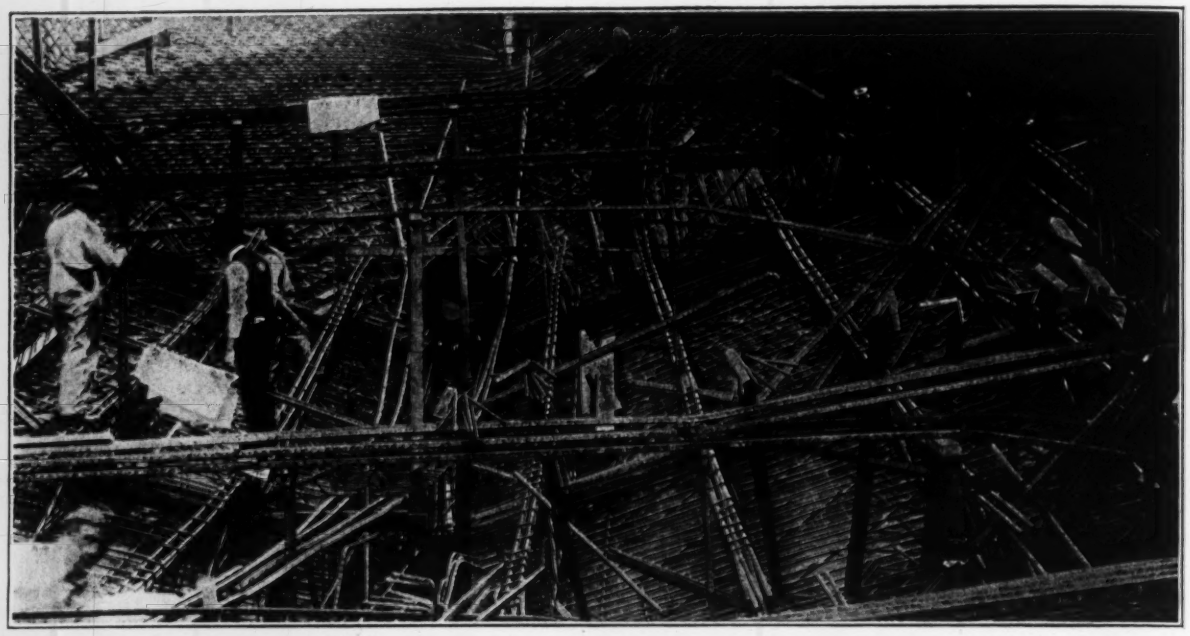
PLOYED—THE CONCRETE IS HOISTED IN THE TOWER AND DISTRIBUTED IN CARTS ON A RUNWAY—THE VIEW AT THE BOTTOM OF THE PAGE SHOWS THE WOODEN FORMS IN PLACE ON THE FLOOR SYSTEM



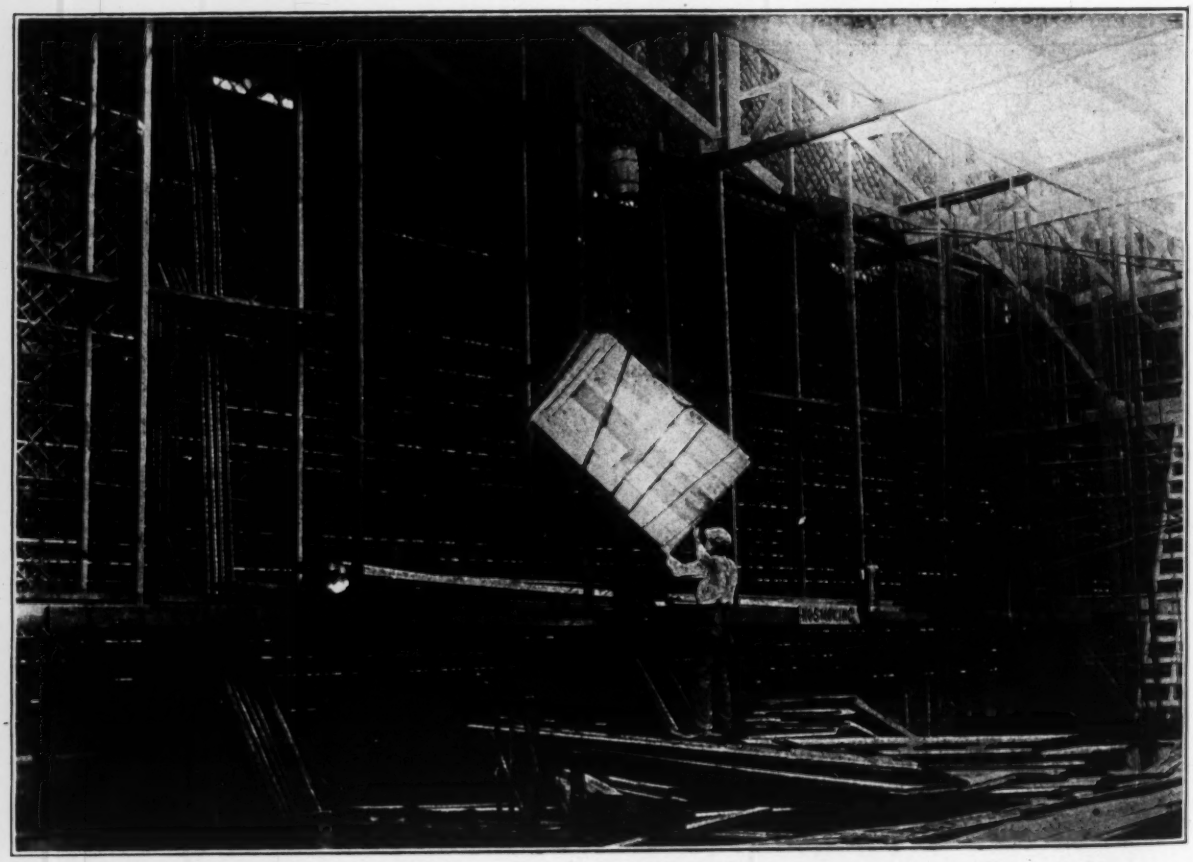
BOTTOM AND SIDE STEEL IN POSITION—PLACING OF STRONG FRAME STEEL WELL ADVANCED



VIEW ON DEC. 31, 1917, LOOKING FORWARD—STEEL FOR BULKHEADS PARTIALLY PLACED



STERN, SHOWING PROPELLER SHAFT SLEEVE—PLACING OF STEEL NOT COMPLETED



REINFORCING OF SHELL AND CROSS FRAMES OF CONCRETE SHIP BEING BUILT BY SAN FRANCISCO SHIPBUILDING COMPANY

Stone-Filled Sheet Asphalt Suffers from Inattention to Detail

Uniformity of Composition Must Be Maintained and Sufficient Surface Energy from Fine Aggregate Provided—A Maximum Thickness of One and a Half Inches on a Close Binder Is Best Practice

By Clifford Richardson
Consulting Engineer, Barber Asphalt Paving Co., New York City

STONE-FILLED asphalt surfaces may be defined as those in which stone, the size of which in various types may be varied from ¼ in. to ½ in., up to 1½ in., or more, coated with asphalt, is a component, uniformly distributed through and imbedded in a mortar of the composition commonly used in the construction of sheet asphalt pavements. Surfaces of this nature have attracted attention during the past six or seven years, becoming known as "Topeka" surfaces from the ruling of the United States District Court of the District of Kansas as to their noninfringement of the Warren patents, and have increased in popularity, as a novelty, in recent years. The character of the mineral aggregate of this surface has been discussed by the writer in two communications to *Engineering Record*, June 29, 1912, p. 718, and Dec. 12, 1914, p. 634. While the statements and conclusions expressed in these articles need no modification at the present time, further evidence offered by service tests of this form of construction makes it possible to draw some additional conclusions in regard to the behavior of such surfaces under the travel which our streets and roads are called upon to carry at present, and to lay down certain principles which should be followed to insure successful results.

In one of the earlier papers referred to it was demonstrated that the essential feature of the decision of the court was that if the coarser particles of the mineral aggregate of such a surface did not exceed 22 per cent. passing a 4-mesh sieve and 10 per cent. passing a 2-mesh sieve, it would not infringe the Warren patent. The grading of the finer portion, while specified, was unessential as far as the interpretation of the decision was concerned. It was shown in this article, however, that to insure a satisfactory surface this part of the aggregate should have a composition corresponding to that of a standard sheet-asphalt mixture. Under these limiting conditions the most satisfactory material would be one of standard grading in which were present 22 per cent. of grit passing a screen of 4 meshes to the inch and 10 per cent. passing a 2-mesh screen, to coat which 3.5 per cent. of their weight of additional bitumen is provided. On this basis such a standard mixture would have the following composition:

	Entire Mixture		Stone Out	Stone
Bitumen	8.2	8.2	10.5	3.3
200 mesh	8.7	8.7	13.0	.....
100 mesh	8.6	.....	13.0	.....
80 mesh	8.7	17.3	13.0	.....
50 mesh	16.0	.....	24.0	.....
40 mesh	7.2	23.2	11.0	.....
30 mesh	5.3	.....	8.0	.....
20 mesh	3.3	.....	5.0	.....
10 mesh	2.0	10.6	3.0	.....
4 mesh	22.0	22.0	.....	66.5
2 mesh	10.0	10.0	.....	30.2
	100.0	100.0	100.5	100.0

These data may be compared with the requirements of the court decision by putting them in another form:

	Court	Actual
Bitumen	7–11	8.2
200 mesh	5–11	8.7
40 mesh	18–30	40.5
10 mesh	25–55	10.6
4 mesh	8–22	22.0
2 mesh	–10	10.0

It appears that an asphalt surface with the proposed standard composition does not depart in any essential feature from the court's decision. It does contain a larger percentage of fine sand, a feature that is not controlled by the patent and which is necessary to furnish a mineral aggregate of sufficient surface development to provide the requisite surface energy for a stable mixture.

As examples of the composition of material used in the construction of asphalt surfaces of the stone-filled type, the following will serve:

NEW JERSEY

	Entire Mixture	Stone Cut
Bitumen	8.1	10.6
200 mesh	8.9	13.1
80 mesh	10.7	15.8
40 mesh	25.3	37.3
10 mesh	15.7	23.2
4 mesh	13.0	.....
2 mesh	17.3	.....
Retained on 2 mesh	1.0	.....
	100.0	100.0

BOROUGH OF BRONX, NEW YORK

	Entire Mixture	Stone Out
Bitumen	8.3	10.4
200 mesh	9.4	13.6
80 mesh	9.5	13.7
40 mesh	23.0	33.2
10 mesh	20.2	29.1
4 mesh	15.4	.....
2 mesh	14.2	.....
	100.0	100.0

While the preceding figures may be considered as representing the composition of standard stone-filled asphalt surfaces which an effort should be made to attain in order to secure success under ordinary conditions, it can be improved where extremely heavy travel is to be carried by increasing the amount and improving the character of the filler used, which involves also an increase in bitumen.

A surface mixture prepared with this end in view had the following composition:

NEW YORK CITY

	Composition		Entire Mixture	Stone Out
Asphalt cement,	110 lbs.	Bitumen	8.9	11.1
Portland cement dust,	110 lbs.	200 mesh	11.9	16.5
Sand,	312 lbs.	80 mesh	14.5	20.1
Stone screenings,	564 lbs.	40 mesh	18.6	25.9
	1,096 lbs.	10 mesh	18.9	26.4
		4 mesh	19.1	.....
		2 mesh	8.1	.....
			100.0	100.0

Very similar to this was a mixture made without the definite addition of portland cement:

ROCHESTER, N. Y.

	Entire Mixture	Stone Out
Bitumen	8 9	11 1
200 mesh	12 3	17 1
80 mesh	10 8	15 0
40 mesh	24 2	33 7
10 mesh	16 3	22 7
4 mesh	21 5	.....
2 mesh	5 4	.....
	99 4	99 6

On the other hand, a departure from the standard in the direction of a poorer grading of the finer portion of the aggregate, as evidenced by the deficiency in sand grains of 80- and 100-mesh size and a lack of filler, will result in a form of construction exhibiting the defects which would be found in an ordinary sheet-asphalt surface possessing the same deficiencies. As examples of stone-filled surfaces of this description the following will serve:

	A MICHIGAN CITY, 1916		AN ILLINOIS CITY, 1916	
	Entire Mixture	Stone Out	Entire Mixture	Stone Out
Bitumen	5 9	7 1	7 2	9 1
200 mesh	8 3	11 7	4 8	7 3
80 mesh	5 3	7 4	5 5	8 4
40 mesh	26 2	37 0	21 0	32 2
10 mesh	26 0	36 8	28 0	43 0
4 mesh	25 3	.....	19 0	.....
2 mesh	1 0	.....	14 5	.....
	100 0	100 0	100 0	100 0

It is plain that such mixtures would result in a very inferior pavement, since it is shown by calculating the composition of the fine portion that one is very deficient in bitumen, one in filler and both in fine sand—and, therefore, too coarse to be stable.

With the diminution in the amount of particles of 4- and 2-mesh size in the mineral aggregate the percentage of bitumen required will, of course, be increased. In the previous examples cited the amount of material of this size has approached the limit permitted by the court decision; but, if in any mixture a smaller amount is present and the mineral aggregate finer as a consequence, the percentage of bitumen required will naturally be larger, as is demonstrated by two mixtures laid in Ontario in 1916:

Bitumen	200	80	40	10	4	2
9.4	12 7	17 7	27 2	17 1	9 1	6 8
9.3	8 6	10 8	32 8	27 7	7 3	3 5

It will be seen that the composition of these mixtures approaches more nearly that of an ordinary sheet-asphalt surface than in the case of those which have been previously cited. Such a mixture cannot be regarded as inferior in a way. It is merely more expensive because of the larger amount of asphalt which is necessarily consumed in its production, owing to the fact that the mineral aggregate is finer.

The preceding statements refer solely to the character of the surface mixture itself without regard to the form of construction of the pavement. The latter consideration is, however, of quite as much importance as the former—the successful behavior of a pavement under heavy travel being as dependent upon the design as upon the materials of construction.

In the production of satisfactory stone-filled mixtures a plant which provides for separating by screening and storing the coarser and finer portions of the aggregate must be available. If the mineral aggregate as it comes heated from the drums is collected in a single bin, segregation takes place. The particles of stone are not uniformly distributed in the bin, and they are still further separated in drawing a charge from the bin to the measuring box. The result is a lack of uniformity in the grading of the mineral aggregate in the mixture as it is sent to the street. This may be illustrated by data showing the composition of a surface mixture produced in this way. In a locality where a rather extended piece of construction was carried out, involving the analysis of sixteen samples, the mixture varied as shown in the following figures:

Bitumen	7 7		9 8	
200 mesh	11 3		11 7	
80 mesh	6 5		8 0	
40 mesh	22 5		39 0	
10 mesh	22 0		18 0	
4 mesh	5 5	30 0	4 0	13 5
2 mesh	24 5		9 5	
	100 0		100 0	

To avoid results such as are illustrated by the previous figures, a plant should be provided in which proper screens separate the hot mineral aggregate into coarser and finer portions which are collected in separate bins. Under such conditions the proportion of coarse to fine aggregate can be better regulated by weighing the two components separately. The grading of a surface mixture turned out at a plant providing such facilities is shown by the following figures:

Bitumen	8 2		8 1		8 9		8 9	
200 mesh	10 3		7 9		9 6		9 6	
80 mesh	9 0		10 0		8 0		7 5	
40 mesh	24 5		23 0		24 5		23 0	
10 mesh	20 0		19 0		20 5		18 0	
4 mesh	15 5	28 0	20 0	32 0	15 5	28 5	15 5	33 0
2 mesh	12 5		12 0		13 0		17 5	
	100 0		100 0		100 0		100 0	

Surfaces of this kind, as is the best practice with ordinary sheet-asphalt surfaces, should be placed on 2 in. of close binder, and should not be more than from 1 to 1½ in. thick. Motor trucks and motor busses are becoming such an important part of the traffic which our streets and roads are called upon to carry at the present time and displacement is caused by the thrust developed by their tires, especially on the application of brakes. Examples of the displacement of the thicker surfaces, especially of those which are placed directly on a concrete foundation with no intermediate course, are so frequent as to demonstrate plainly the defects of such a method of construction.

While the character of the stone-filled surface mixture has been considered at some length in the preceding paragraphs, there are other structural features in connection therewith which cannot be neglected if the use of this type of construction is to succeed. A road surface is no better than the support which it receives—that is to say, than the character of the foundation which supports it—and, furthermore, it is dependent on the stability and dryness of the supporting subsoil which carries this foundation. For this reason, attention to these details of construction are of primary importance.

In conclusion it must be reiterated that a stone-filled or fine asphaltic-concrete asphalt surface requires, in its construction, much greater care and skill and a more elaborate plant than ordinary sheet asphalt; that it should be placed on a course of close binder; and that it should not exceed a thickness of 1½ inches.

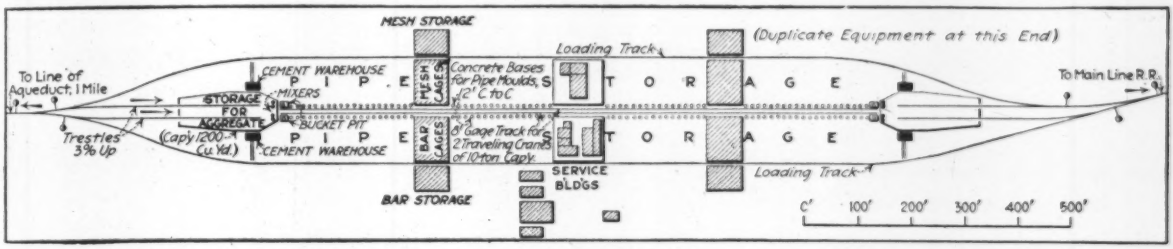
Making and Placing Ten Miles of Concrete Pipe for Winnipeg Aqueduct

Duplicate Yard Layout Permits Rapid Casting of Pipe 5½ Feet in Diameter and 8 Feet Long for Pressure End of Pipe Line—Trenches Dug, Pipe Laid and Trenches Filled with Specially Designed Machines

By K. B. Kumpe

Chief Engineer, Lock Joint Pipe Co., New York City

THE lower 10 miles of the long Winnipeg Aqueduct, that is the section under pressure which connects the flow line with the city mains, is to be of 5½-ft. reinforced-concrete jointed pipe laid in a trench from 14 to 16 ft. deep. All of the pipe, about 6600 in all—for they are cast in 8-ft. lengths—are made in a yard about midway of the line, where a duplicate layout permits rapid pipe manufacture. From this yard the pipes are transported to the trench on a paralleling railway and are put in place by simple but effective machines. The work was started last spring and progressed favorably up to cold weather this winter. This article describes the manufacturing and laying operations.

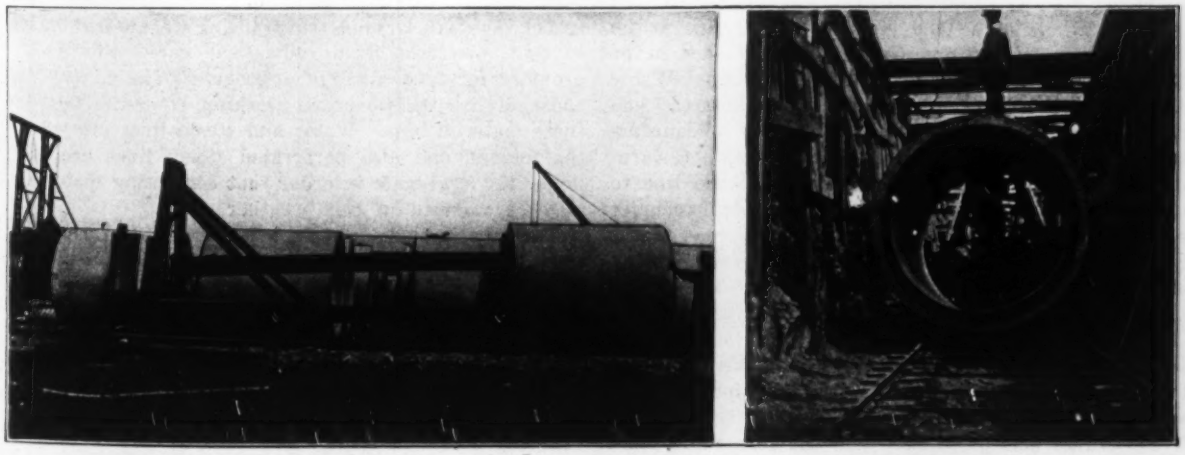


CONCRETE PIPE MAKING PLANT IS IN DUPLICATE AROUND CENTRAL STEEL ASSEMBLY

This line of pipe is circular, 66 in. in internal diameter, with a wall thickness of 8 in. It is reinforced with two concentric steel cages, spaced 2 in. from the inner and outer surfaces, respectively. The inner reinforcing cage is built up of a specially heavy woven section of the American Steel and Wire Co.'s triangular mesh and the outer cages of ½-in. to ⅝-in. square twisted bars, the spacing and size varying with the 45- to 90-ft. head. The mesh, having a constant area, is supplemented where necessary by hard-drawn round rods from No. 4 to $\frac{7}{16}$ in., this reinforcement varying with the amount of backfill and other conditions of external loading, as when passing under highways and railroads.

On account of the depth to which frost penetrates in this locality there is a minimum cover of 6 ft. of earth over the top of the pipe, and the trench is therefore of an average depth of 14 to 16 ft. Heavy blue and yellow clay predominates, and in taking out this excavation a double row of round piling on 11-ft. centers was first driven with the tops flush with the ground. The piles in each row are placed on from 2 to 4 ft. centers and in length averaged about 20 ft. A 40-ton steam shovel carried on movable sectional timber mats resting on the pile tops was used in taking out the cut, the bottom being trimmed by hand.

The foundation for the pipe consists of 7 in. of coarse bank-run gravel spread evenly over the trench bottom. After the pipe is laid, vertical form boards are carried almost to the spring line and a concrete cradle is poured on both sides of the pipe. Coarse gravel backfill is carried to the spring line after the form boards are re-



THE PIPE PLACING MACHINE OUTSIDE THE TRENCH AND A PIPE IN THE TRENCH ON THE MACHINE

moved, and a tamped backfill of clay is carried to one foot above the top of the pipe. After the joints are poured the complete backfill is made by drag-line scrapers.

After the tamped backfill is completed and before the joints are poured, a pile puller straddling the trench removes the piles, and they are moved ahead to be redriven. The pile holes are carefully filled with tamped gravel as soon as piles are pulled.

A vitrified drain pipe is carried on one side of the trench for its entire length and finally discharges into the Red River. This tile is between the cradle and the trench side and ground water entering the opposite side of the trench is expected to find its way to this tile by means of the coarse gravel bed.

BOOM DERRICK ON CATERPILLAR TRANSFERS PIPE FROM RAILWAY TO TRENCH DUG BY STEAM SHOVEL TRAVELING ON SECTIONAL MATS

The entire contract was undertaken by the Winnipeg Aqueduct Construction Co., who subcontracted the manufacturing, laying and jointing of this pipe to the Canada Lock Joint Pipe Co., Ltd., whose design of joint had been accepted by the Greater Winnipeg Water District at the time of awarding the contract. The Canada Lock Joint Pipe Co., Ltd., erected a manufacturing plant near Transcona on the Canadian Government Rys., at a point almost midway of the line to be built and distant about one mile. This plant occupies about fifteen acres and is provided with railroad tracks connecting both with the Canadian Government Rys. and the line which parallels the trench. The layout of the yard is shown in the accompanying drawing.

An 8-ft.-gage track, 1075 ft. long, is laid through the center of this yard, to care for two double cantilever cranes which handle all concrete to the pipe molds as well as place all reinforcement after it is built up. These cranes also place and strip the forms and place the pipe on the skidways after it is sufficiently cured to permit handling. A view of one of the cranes is shown in one of the views herewith.

Parallel to this track on each side are 144 concrete slabs to provide a firm foundation for the cast-iron base forms, of which there are also 144. These concrete bases are each provided with five steam jets, one at the center and four on the outside, which in turn are connected through a valve with a steam line fed by two 60-hp. locomotive-type boilers. Canvas covers are provided which enable the pipe to be subjected to a mild moist steam for 48 hours, in order to accelerate the setting.

At each end of the crane track are two pits to receive the 1½-yd. conical concrete buckets, which are each fed by two 10-cu.ft. Little Wonder mixers, gasoline driven. On the cover of this issue is a view of one group of these mixers. Behind each bank of four mixers are two elevated tracks from which the aggregate is dumped to tight platforms from side dump cars. Storage is provided for 3000 cu.yd. of aggregate. The mixers are charged with wheelbarrows working from the face of these material bins. Water and steam lines are led to the mixers, and also perforated steam lines are laid under the aggregate in order that concreting materials may be warmed in cold weather.

The pipe is made in 8 ft. lengths, and 36 forms are provided, giving a daily capacity of 288 lin.ft. of pipe; and, as there are 144 cast-iron bases, it is possible to leave the pipe four days after pouring before tipping and placing on skidways. Each 8-ft. section of pipe weighs approximately 17,000 pounds.

Parallel to the center crane track and 100 ft. distant on each side is a standard-gage track where, by means of a car derrick, the pipe is loaded to cars for transporting to the trench. Each end of the yard is an exact

duplicate of the other, and while the crane and mixer crew is concreting 18 pipe, the other crane is setting up at the other end, after which operations are reversed. Four fabrication yards are provided, two for mesh and two for bar cages. Here, by means of rolls and special mandrels, the cages are built up and rolled to position for cranes to pick up and place on the forms. Shops, storehouses for cement, etc., as well as accommodations for the men are provided.

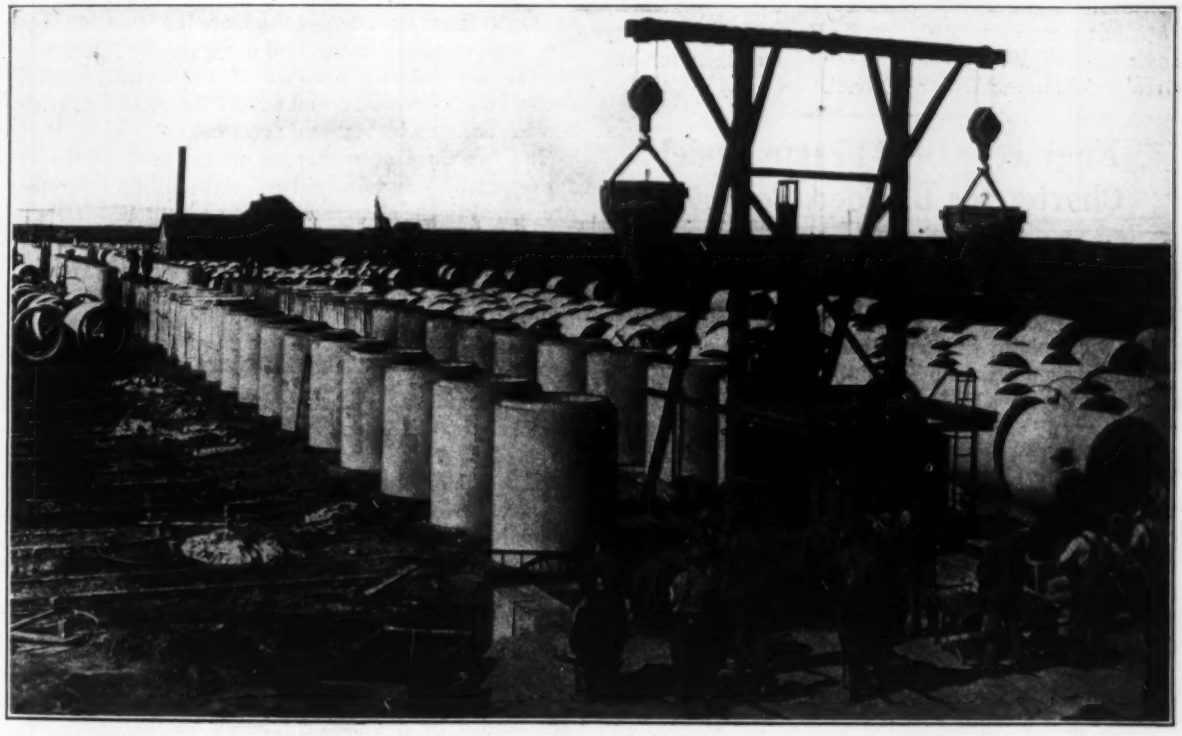
The aggregate as furnished by the Greater Winnipeg Water District contains approximately 42% sand and 58% gravel of a maximum size of 1½ in. Approximately 1.9 bbl. of cement are used per cubic yard of concrete. The daily output of the plant calls for 136 cu.yd. of concrete, 270 bbl. of cement and 15 tons of steel.

Parallel to the trench for its entire length is a standard-gage railroad, over which pipe, gravel, cement and other material are delivered to the site of the work. A crane of 10 tons capacity having a caterpillar traction is provided to take pipe from the car and place it in the trench. It is shown at work in one of the views. The laying machine consists of a four-wheel truck of standard gage and 15-ft. wheel centers, on which is mounted a 20-ft. beam pivoted over the front set of trucks. The extension of this beam carries a 4-ft. timber given a wide movement by a ball and socket joint, while the other end is connected through an A-frame and suitable sheaves to a three-ton chain hoist. Under the pivot point of beam is a ratchet slide giving cross movement. Concrete counterweights on the rear of the truck permit of the pipe being balanced on the end of the beam and moved ahead to enter its spigot accurately into the bell of the one previously laid. This laying rig runs in the trench on a track of 20-lb. rail in 10-ft. lengths mounted on 3 x 10-in. timbers. Opposite rails are held to gage by bridle rods easily removable to permit pipe to be laid between rails, which are then taken up and moved back. As many as 30 pipe or 240 ft. per ten-hour day have been placed by this method. Two views of the laying machine appear herewith.

After the pipes are joined the space between shoulders is pointed up with a stiff mortar, whose function is to prevent dirt or ground water entering the joint recess before the joint is made and also to retain the grout while pouring the joint.

As previously mentioned, the joint is not poured until the backfill is brought up to one foot above the top of pipe and the piles are pulled, as it is desirable that final settlement or displacement, if any, take place while the individual lengths of pipe are free to move without injury to the joint.

After each length of pipe is correctly placed to line and grade a hole about 4 in. square is broken out of the bell to serve later as a means of introducing the joint grout. This hole is temporarily covered with a piece of roofing paper and held in place by a small amount of mortar.



CANTILEVER CRANE CARRIES CONCRETE BUCKETS FROM MIXERS IN FOREGROUND TO PIPE BEING CAST

There is placed in the spigot of the pipe when manufactured an endless copper band 5 in. wide, having a closed bead rolled into it 1½ in. from one edge. This copper water stop is so placed that the bead is just at the end of the spigot, leaving 1½ in. of copper protruding. The outside end of the spigot is painted with a thin asphaltic coat to prevent the grout joint or key from bonding to the pipe itself, although the copper is roughened to insure this key being firmly gripped by the grout, which is also bonded to the bell end of the

other pipe by means of the protruding mesh, as in the Meriwether lock joint.

After the backfill has been placed for a sufficient time to insure all final settlement having taken place, the joint recess is carefully cleaned out and wetted, and a steel sealing band or form is closely fitted to the inside of the pipe, lapping over the joint recess. The cover over the hole previously broken in the top of the joint is then removed, and the recess filled with a 1:1 mortar. After hardening properly, the forms are removed, and the joint is scraped and roughened to receive properly the secondary joint.

The poured or primary joints are not brought out to the surface of the pipe, but are recessed $\frac{3}{16}$ in. and this recess is later filled and a continuous smooth surface formed by a plaster coat of neat cement, specially ground to pass a 200-mesh screen.

Laying has been carried out on two points, and the equipment above described has been duplicated.

This contract approximates $1,350,000 in cash and is to be completed on Oct. 31, 1918. Work was commenced on the construction of plant and railroads in March of this year, and in spite of a very early close down this fall on account of cold weather, approximately 45% has been completed. J. H. Fuertes is consulting engineer and W. G. Chace is chief engineer for the Greater Winnipeg Water District.

Engineers Help Frame Model Charter for Boulder, Colorado

Commission-Manager Plan Has Good Engineering Provisions—Two Engineers Elected to First Commission

THE complaint that engineers do not take the part they should in public affairs is often and justly made. It does not hold good at Boulder, Colo., in so far as the recent framing of a new city charter and the membership of the first council for commission are concerned. Three engineers were active workers for the new charter and one of these was secretary of the charter commission. This secretary and one of the two other engineer workers for the charter were selected in December as members of the commission of nine which assumed charge of the affairs of the city on Jan. 1. The two engineer-members of the new commission are Prof. H. S. Evans, of the University of Colorado, and Clair V. Mann, the latter having been member and secretary of the charter commission and serving also as secretary of the council-elect before the council took office. The third engineer was Assistant Professor Howard E. Phelps.

Municipal Home-Rule Charter

More than a year ago Mr. Mann, in company with two others, began to agitate for a new charter. They secured the coöperation of the so-called middle and working classes. A charter commission of 21 members was elected at a mass meeting and drafted the charter in accordance with the "home-rule" amendment of the State Constitution of Colorado.

Boulder is a city with an estimated population of 12,000, located at the eastern base of the Rocky Mountains, not far from Denver. Under its new charter the city has powers limited only by the constitution of the state and of the United States.

The charter is of the commission-manager type. Besides providing for the initiative, the referendum and the recall, it requires nomination for members of the council (the only elective officers), and also for election in accordance with the Hare system of preferential voting. The recall relates only to elective officers and does not apply during the first six months of holding office. No utility franchise can be granted except by popular vote, and none for a period of more than twenty years.

Nine-Man Council with No Executive Power

The council or commission consists of nine members, elected for terms of three years. Except that it appoints a city manager, a city attorney, a police magistrate, an auditor, and certain advisory boards, the powers of the council are legislative only, it being compelled to deal with all administrative matters solely and directly through the city manager. The members of the council are expressly forbidden to "either dictate the appointment or direct or interfere with the work of any officer or employee under the city manager. Any such dictation, attempted direction, or interference on the part of any member of the council shall be deemed a misdemeanor, and any of the council convicted of such act may be removed from office."

The functions of mayor as official head of the city for ceremonial, certain civil and state military purposes, are vested in the chairman of the council, who is elected by that body to serve for two years. The mayor may be removed from his office as mayor but not from the office of councilman, by a two-thirds vote of all the members of the council.

City Manager Selected On Merit

The city manager is chosen by the council "solely on the basis of his executive and administrative qualifications. The choice need not be limited to the inhabitants of the city or state." The appointment is for an indefinite period, but the manager is removable by the council at pleasure. If the council proposes to remove the manager after six months' service, he may demand written charges and a public hearing. The administrative work of the city, in each case under the supervision and control of the city manager, is intrusted to six departments. Four of these; namely, public service, finance and records, public health, and public welfare, are headed by a director "chosen on the basis of his general executive and administrative experience and ability, and of his special education, training and experience in the class of work which he is to administer; provided that the director of public service shall be an engineer with training and experience in municipal engineering; and the director of public health shall be a sanitary engineer, or a member of the medical profession, who has had special training in public-health work."

Service Director Ex-Officio City Engineer

The director of public service is ex-officio city engineer. He has charge of the construction, improvement, repair and maintenance of the various public works

and utilities of the city, including the construction and maintenance of parks and playgrounds, but not their management.

The city manager, until otherwise provided by charter amendment, is ex-officio director of public safety. The department of planning and parks is in charge of a planning and parks commission, consisting of the city manager, the director of public service and public welfare, and six especially qualified citizens, the latter serving without pay and being appointed by the council and removable by the council for cause.

The city manager frames the annual budgets which must show in parallel columns the actual receipts from taxes and other sources for the current and the last preceding year and the estimated revenues of the city for the ensuing fiscal year.

Bonded indebtedness must not be incurred in excess of 3% of the assessed valuation of the taxable property of the city, but this limit shall not apply to bonds issued for the construction of water-works and other public utilities that produce a revenue. Water-works revenues shall be used exclusively for water-works purposes. No free water service will be given other than to the city itself.

For any and all municipally-owned utilities, the city must keep separate accounts which shall show complete financial results in all respects, including the value of water or other services furnished for the use of the city.

A civil service commission may be created by the council in the future if it sees fit. Except for the officers already named as appointed by the council, all appointments are made by the city manager, including various subordinates.

Before taking office, the council elect advertised in the technical press for applications for the position of city manager. On Dec. 30, Mr. Mann wrote as follows: "The council elect of the city of Boulder is finding that there are many prospective city managers in the country who read *Engineering News-Record*. We have had a flood of applications, principally from engineers. Many of these are from prominent and experienced men."

How Soon After Concreting Should a Pavement Be Rolled?

That different intervals should be allowed between the several finishing processes on a concrete road in summer and in fall is conceded, but what are they? On an 18-ft. pavement on Lincoln Avenue road, Cook County, Illinois, the contractor, the Chicago Heights Coal Co., got the best results by rolling one hour after the concrete was deposited and screeded. He increased the time in the fall to two hours. The same intervals applied when a 10-in. canvas belt was used instead. In summer there was an interval of from one-half to one hour between the rolling or belt dressing and the final belt finish. In the fall it was necessary for the best results to increase this interval to 1½ to two hours. The 9-in. 70-lb. sheet-iron roller was 6 ft. long and was operated by two ropes instead of by a long handle. On this work 30 to 35 men averaged 413 lin.ft. of 18-ft. pavement per day, the best day's work being 538 lin.ft.

Williard Hildeman is superintendent for the contractor and A. F. Keehner is resident engineer.

Sump in Combined Sewer Diverts Flow to Sanitary Sewer

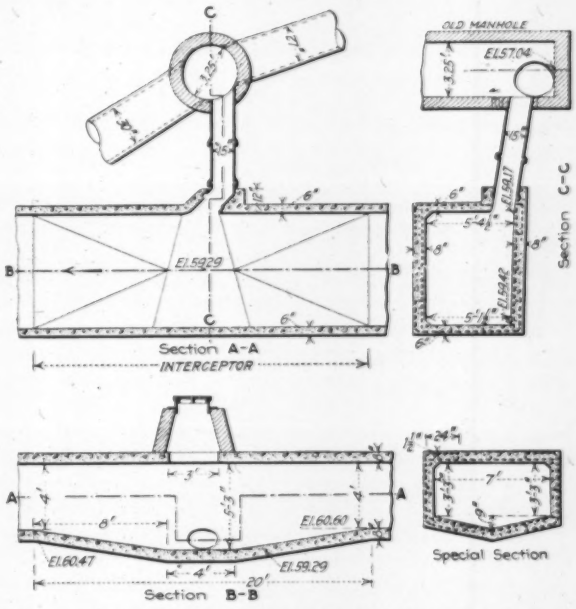
In Successful Use at Kansas City, Mo.—Design Shown Could Be Adapted to General Use

By H. F. Johnson

Assistant Engineer, Union Pacific Railroad Co., Hastings, Neb.

THE writer has never found a design for a sewer intercepter which he considered satisfactory. The intercepter shown herewith was designed under his direction while he was engineer in charge of the sewer division at Kansas City, Mo. Although this design has some disadvantages, it is believed that it eliminates some of the faults of the ordinary hopper bottom, overflow and leaping weir intercepters.

The intercepter shown is primarily a sump in the invert of a combined sewer, with a sanitary outlet having its flow directed away from the storm flow. The



SUMP INTERCEPTER DIVERTS SEWAGE FROM COMBINED TO SANITARY SEWER

sump is of sufficient capacity to feed to the sanitary outlet the estimated maximum volume of sanitary sewage from the district served, during the life of the sewer.

This form of intercepter does not collect and wash into the sanitary sewer as great a quantity of detritus as do some of the ordinary forms of intercepters. The small amount of detritus which accumulates is washed through the storm-water outfall during the next storm.

The intercepter illustrated has been in use at Kansas City for nearly two years and has given entire satisfaction. It was built to conform to and connect with a special section made necessary by the small amount of head room available in this particular case. However, the design could easily be modified to fit almost any sewer section.

Place and Duty of the Engineer in the Social Structure

Should Form Local Associations Devoted to the Larger Service of the Community—Union of All the Founder Societies the Greatest Step in the Advancement of the Profession

[Due to the abandonment of the last convention of the American Society of Civil Engineers, which was to have been held in June, 1917, the Board of Direction requested George H. Pegram, the retiring president, to deliver his annual address at the annual meeting which is being held this week at the United Engineering Societies' Building, New York City. Through the courtesy of Mr. Pegram, extracts from his remarks are given here.]

THE great world-war is imposing supreme tests on the virtues, faults, and philosophies of all peoples: their industrial, economic, financial and political organizations will undergo great changes. In this reformation there is the greatest hope for the engineer, and as he has always been the keystone in the arch of war he may become the keystone in the arch of peace.

Practically all of the world's great military commanders have been engineers—Cæsar, Bonaparte, Wellington, in the past, and in the present war, Joffre, Haig and Hindenburg.

In our own country many of the men who gained prominence during the Revolutionary War were surveyors, that being the general work of the engineer of that day. Ira Allen of Vermont, one of the ablest diplomats and financiers of his time, was a surveyor, serving for a number of years as surveyor-general of his state. He was one of the first to propose building the canal to connect Lake Champlain with the St. Lawrence River. General Stark, the hero of the Battle of Bennington, was a millwright. General Wayne, like his great commander General Washington, was a surveyor, and at the beginning of the Revolution was surveying in Ohio. In our Civil War the engineer was similarly prominent, and this was emphasized among the officers drawn from civil life.

War involves many engineering operations—in fact at the present time it has become so much an engineering science that we might expect such a distinction were it not that higher qualities than mere professional technique are required in generalship which demands the organization and control of masses of men and administrative ability of the very highest order. The engineer has so generally responded to these higher requirements in time of war when the best services must be had, that we may reasonably ask why greater use is not made of his administrative qualities in times of peace.

Preparation for War

Nearly three years ago our engineers began the agitation of preparedness for war. In March, 1915, a committee was appointed whose work resulted in law authorizing the Engineer Officers' Reserve Corps, by which civilian engineers are made part of the army. Groups of engineers in different parts of the country provided military lectures, preparedness parades and other movements in anticipation of the possibility of our being drawn into the war.

In appreciation of the services which might be rendered by the enginers, the Administration at Washington wisely called them into council, resulting in the formation of the Naval Advisory Board, the Council of National Defense, and the Bureau of Scientific Research, in all of which our most skilled and prominent engineers have from the first been, and are now, unselfishly devoting their services to the needs of the country without remunerative return even for their expenditures. And our society, as you know, offered its services to the President immediately upon the declaration of war and has responded to every call.

Eleven Per Cent. of Membership in Army

In spite of the fact that but 11.5 per cent. of our membership is within the draft age limit, 11 per cent. is now in the army and the number is rapidly increasing. Men of mature age without previous military training, but whose prominence in the profession would entitle them to entire immunity, have gone to the front.

The Engineering Mission from the United States to Russia has performed a task which, despite the political revolution, must bear great future fruit—for Russia, next to China, has the greatest undeveloped resources of any country in the world. And hereafter the field of the engineer, like the present field of the soldier, will be less limited by national boundaries.

The engineer by his education and technical training and especially because he enjoys the confidence of all classes of the community, is well prepared to enter actively into public discussions and public service, and should do so. To that end the engineer should form local associations devoted, beyond the consideration of the technical and scientific aspects of engineering, to the larger service of the community as a coöperative part in public affairs.

Determination of Engineers to Coöperate

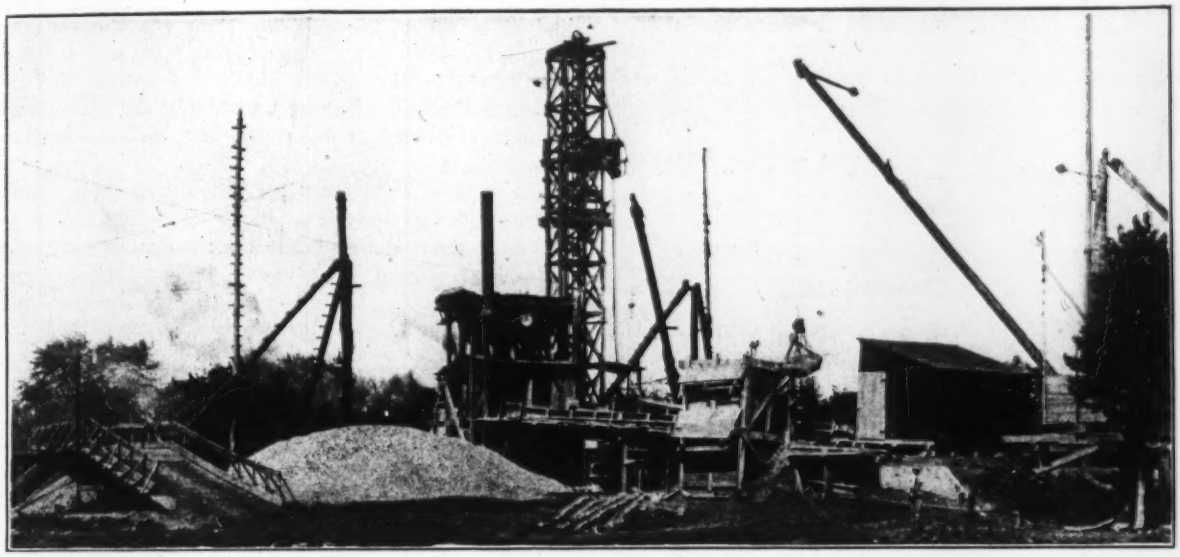
Last year our society joined with the other founder societies in the formation of the Engineering Council, designed to represent the present growing membership of thirty thousand engineers in the consideration of public matters. While in itself the greatest step that has been taken looking to the advancement of the profession, the movement is especially inspiring as indicating the determination of engineers to coöperate. At the magnificent celebration at which we were welcomed to our new home by the other founder societies this sentiment was expressed by all the speakers.

But other steps are necessary. It would seem that an organization should be formed devoted to the material interests of the younger men, draftsmen, instrument men, inspectors, etc., with such association with the older engineers that their development and progress may be encouraged; in brief, an alliance of all engineering interests which would be in harmony with similar organizations in nearly all lines of endeavor.

Land Big Drop Shaft on Seal and Curb Wall

Fifteen-Pocket Concrete Caisson Sunk 100 Feet—Because of Thick Boulder Stratum Near Top Shaft Proved Hard To Guide

A CONCRETE caisson constructed on Government property under the direction of the Bureau of Yards and Docks for a special purpose which required landing it exactly to grade and in a vertical position, has just been completed after some remarkable work in guiding and handling. Though air was not used, pumps keeping the water down so that material could be dug from beneath the cutting edges by hand, the 45 x 78-ft. reinforced-concrete box was too large to permit the use of guide-frames, pushers and other building-caisson methods. When, therefore, it neared the bottom a few inches out of plumb, a heavy concrete seal was placed and a concrete curb wall built to exact elevation before the last drop was taken. In the meantime, jets supplied with several hundred pounds' pressure by borrowed fire engines were used to churn up the soil on the high side, from which weight had previously been removed by taking off the overburden with a steam shovel.



CONCRETE SPOUTING PLANT AND TWO DREDGING DERRICKS, ONE AT EACH END, HANDLED CAISSON

On account of the peculiar use to be made of it, the caisson differs from bridge-pier or power-plant construction in design, and from mine shafts in size. Its outer walls, shod with a fabricated steel cutting edge, are of 5-ft. thick reinforced concrete, 45 x 78 ft. in overall dimensions. The space inside these walls is divided into three pockets across the width and five pockets along the length of the caisson, making fifteen in all. Between these pockets are 2-ft. thick reinforced-concrete dividing walls, extending from a point 2 ft. above the cutting edge to the middle of the caisson, 50 ft. from the top. Above the concrete walls the division into pockets will be continued with steel walls which were not installed until the caisson had been sunk. On this account, timber bracing above the line of the dividing walls was put in. To facilitate dredging, the inside of each pocket was lined with vertical 4 x 12-in. plank. The caisson will be part of a Government factory building inside which it is located. The floor level of this building was 12 ft. below the original ground surface at the point where the caisson was located, and as the latter was of course begun first, it was possible to excavate quite a deep open pit before erecting the cutting edge.

This pit extended within 8 ft. of ground water level, which, taking the finished floor at 100 and the cutting edge in final position at 0, would be elevation 78. The pit was in clay, and on its floor the steel cutting edge was blocked up and erected in the usual way, and concrete placed to a height of 14 ft. for the first lift. After this, concrete was placed in 6-ft. lifts, one being placed, bringing the structure to a height of 20 ft., before sinking was begun. This was the greatest height above ground reached during construction, though on another occasion a little more than two lifts were above the ground at one time.

The sinking was carried on by a derrick with a 60-ft. boom set at each end of the box. These derricks, operated with three-drum hoists, handled 1½-yd. clamshell buckets. The excavated material was dumped into a hopper and taken away by teams.

Near water level the sinking encountered sand and gravel for 11 ft., below which for 19 ft. the gravel seam contained boulders up to 1 yd. in size. Much of this material ran in, and caused some caving around the caisson. Until a 20-ft. seam of shale below it had been entered, shutting off the water, the caisson could not be pumped, and was dredged down in the wet. Below the shale the caisson was carried 39 ft. through layers of sand, peat and clay. All this material had to be picked and shoveled from beneath the cutting edge and cross-

walls to the centers of the pockets where it could be reached by the grab-buckets. During this time the water was handled without difficulty by several large Pulsometer and Nye steam pumps, of which nine were on the job. Two lifts were required, the lower pumps discharging into a tank half way up the caisson, from which point the second set of pumps raised the water to the surface.

The caisson, when virtually complete, weighed 10,000 tons. In addition to the weight of concrete, some of the

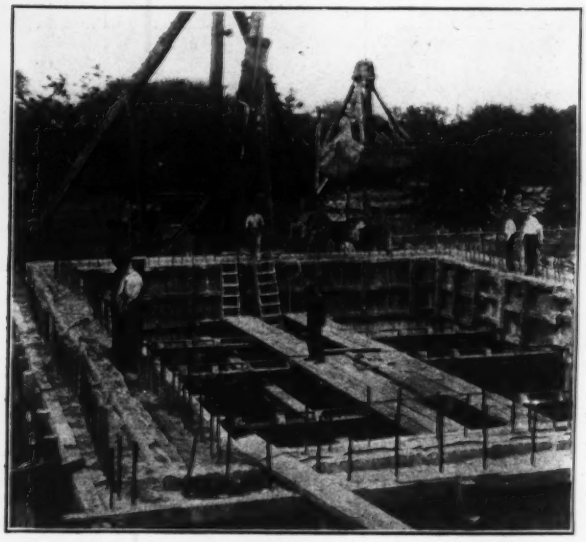
STEEL-SHOD CONCRETE CUTTING EDGE WAS HEAVILY REINFORCED

pockets were floored over and filled with dirt for additional weight during sinking. A maximum of about 1000 tons of earth could be added in this way. Often, however, this was not sufficient to make the caisson drop as desired. To jar the surrounding earth, in order to lighten the skin friction and give the caisson a chance to start, small charges of dynamite were fired in the ground around the caisson. The effects of this shooting were immediate in virtually every case, the box moving from 6 in. to 8 ft. at a time. It was finally found best to put down about six shots on each long side, loading each hole with 1½ lb. of dynamite and firing all together with a battery. The shots were generally placed about half-way between the cutting edge and the surface, and about 3 ft. from the outside skin.

During the descent the caisson, as was only to be expected with a shaft of such size, got slightly out of plumb. Most of the movement was at right angles to the long dimension and away from the side on which the concrete plant was located. This left one long side of the cutting edge higher than the other. The entire movement amounted to less than five inches out of the perpendicular in the height of the caisson. By this time the caisson had passed through the sand and boulders and was well entered in the stiff clay. Efforts were made, by placing almost solid blocking under the low side of the cutting edge, to right the caisson in taking a drop. This had little effect on account of the great side area of the caisson and the consequent amount of dirt to be displaced. Next, the blocking was tried in connection with extensive jetting along the high side, in an effort to displace some of the sand and gravel and reduce the shale to a mushy consistency. A fire engine was borrowed for the purpose and pressure of about 250 lb. was put on the jets. Even this, though the jets penetrated the shale, did not have much effect, the caisson still being 4½ in. out of plumb after taking a drop which brought it to within 3 ft. of grade.

It was then decided that there would be a better chance of success if the earth on the high side of the caisson, on which the concrete plant stood, were cut down to final floor level. The concrete plant was accordingly moved to the opposite side of the caisson before putting in the seal. During the moving the excavation was carried down 5 ft. below the final elevation of the cutting edge.

The excavation for the main building was well along by this date, and it required only a short time to throw one of the steam shovels engaged on it against the bank on the high side of the caisson. In less than a week this was removed. The excavation inside the shaft itself was finished and a concrete bench from 4 to 6 ft.



TIMBER BRACING REPLACED AFTER COMPLETION WITH STEEL

wide was carried up all around under the cutting edge, its top being at the exact final elevation required.

The final drop was taken after the ground on the high side of the caisson had been jetted under about 300 lb. pressure by a fire engine. Although the drop did not right the caisson, possibly because it was surrounded by boulders too heavy to be affected by any jetting, the concrete curb, which crushed slightly on the low side, stopped the caisson at exact elevation, and the jetting and blocking prevented it from going any further out of plumb.

When completed, the concrete seal will extend to a height of 10 ft. above cutting edge, or 8 ft. above the lower edge of the original dividing walls. Including the seal, 6000 yd. of concrete are required for the entire structure. The sand and gravel for this concrete were delivered on the ground back of the concrete plant by motor trucks from a pier a few hundred feet from the site, while cement was hauled about 1000 ft. from a railroad siding. The bins over the concrete mixer were kept filled by a clamshell derrick. The concrete was placed by a spouting system which covered the entire caisson. The caisson was very heavily reinforced, 350 tons of bars being placed in the outside and dividing walls. The bars were mostly straight and were handled and set in the forms by hand.

The work was done for the Navy Department by The Foundation Co., under the direction of the public works officer of the reservation concerned, and under the general supervision of the Bureau of Yards and Docks, of which Rear Admiral Frederick R. Harris was chief at the time.

Land Reclamation Offers a Wide Engineering Field

Initiative and Coöperative Action Help Technical Skill in Increasing Food Resources

POSSIBILITIES for the engineer in developing the productive use of the arid and swampy areas of the public lands form the theme of a recent paper on "Engineering Work in Food Supply," by Prof. F. H. Newell, head of the civil engineering department of the University of Illinois. This was presented at the annual meeting of the American Society of Agricultural Engineers, held in Chicago Dec. 27 to 29. These notes are taken from his paper.

Enormous tracts of vacant public lands remain in the Western states, but these cannot be utilized at once, and cannot be disposed of in the same manner as the lands given away a generation ago. The best lands and the choice spots have passed into private or corporate control, and it is the less favorable lands that remain. The agricultural engineer has here his great duty and opportunity in studying the conditions of soil, climate, transportation and market facilities, and then devising ways in which the land may be put into the hands of men who can till it successfully.

Utilize Both Deserts and Swamps

Great schemes for reclamation of desert lands by water stored in mountain reservoirs may be evolved by the engineer, but he finds that each scheme has some apparently unsurmountable obstacle. He learns that comparatively few of the settlers make a success, due partly to lack of skill or experience, but more largely to need of adequate capital. He learns also that after the lands have been watered it has required many years to ascertain the crop and market conditions. Everywhere there is shown to be need of caution in future undertakings.

Beyond these lessons of caution, however, the engineer sees that great progress has been made, and that arid lands formerly regarded as worthless are now producing crops which form an important addition to the food supply in time of stress. He must draw the conclusion that in spite of past errors or present difficulties there is greater possibility in the use of public lands than has yet been realized.

What of the vast swamp areas? The chief difficulty here is that under the mistaken assumptions of a former generation the swamp lands were donated by Congress to the states, with the understanding that the latter would provide for their reclamation. Instead, these lands were practically given away by the states, partly to large corporations. While portions have been reclaimed by drainage, most of them still lie unproductive and are held out of use by speculative interests.

In the flooded areas the agricultural engineer can perhaps most quickly show what can be done by employing his skill and experience. If these lands still remained in the hands of the National Government their development following the precedents established by the Reclamation Act might be relatively simple. They could be drained and disposed of in small tracts to actual settlers. But with the incubus of speculative ownership these lands are apparently doomed to lie idle.

Capitalize Present Investment

In securing an additional supply of food and opportunities for homes for the people the problem rests not so much upon the technical skill of the engineer as upon his recognition of the obstacles of human origin, and his initiative or participation in movements for releasing these vast tracts of overflowed lands and desert areas from present conditions unfavorable to their development and utilization, and for transferring the control to the Government, public corporations, or district organizations which will permit the great work to proceed.

The United States has now over $100,000,000 invested in productive irrigation works. The security if properly treated is unquestionable. Money could be borrowed at a small rate of interest on this investment and made available for expenditure elsewhere in similar reclamation works, by irrigation and drainage, with the creation in turn of property values which again would form the basis for obtaining further funds. There is money still left in the world awaiting investment in such permanently productive projects.

Probabilitity of success has been demonstrated, and there is little that is novel in the undertaking. Private enterprise has spent millions of dollars in demonstration. The United States also, acting through the Reclamation Service, has proved that it is possible for the Government to build and to operate great reclamation works and to conduct the business affairs of settlement of the country. It is none too soon to initiate other and larger enterprises for irrigation and drainage, the successful execution of which means more food, more homes and the more permanent free institutions.

Twelve Hundred Steam Gaging Stations

Steam gaging stations to the number of 1197 were being maintained on June 30, 1917, by the U. S. Geological Survey, according to the annual report of Secretary of the Interior Lane. The stations are located in 41 states, Alaska and Hawaii.

New Ocean Freight Terminal Started on Staten Island

Initial Units for Large Development in New York Harbor Comprise Timber Pier and Concrete Warehouse with Special Freight-Handling Equipmen

A NEW ocean terminal with piers alongside of deep water and immediately adjacent to warehouses connected with various trunk lines, is now under construction on the east shore of Staten Island, in New York Harbor by the Staten Island Development Corporation. The new development is called the Pouch Terminal, Inc., and is under the same management as the American Dock Terminal at Tompkinsville, Staten Island. The geographical location of Staten Island and the particular location of this property, places it in an advantageous position, especially valuable for the business of a dock and warehouse terminal. It is near the entrance to the harbor, thus avoiding loss of time in docking vessels; it is directly on a 40-ft. channel, which permits docking of steamers of the largest size at all tides; it is within the free lighterage limits, which places it commercially on the same basis as other waterfront property in the harbor and it has the advantage of direct rail connection, independent of float or lighterage service. There is double transportation facilities for passengers, being connected both by trolley and steam road to the New York Ferry.

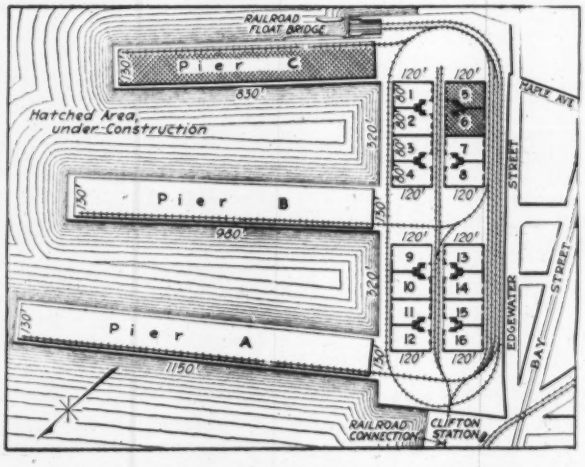
The property now being developed, covers an area of about thirty-three acres and has a waterfrontage of about 1200 ft. and is located just north of the Quarantine Station. The surrounding neighborhood is made up of an old established community and only a short distance from the Italian settlement at Rosebank, which furnishes an excellent labor market for industrial or commercial purposes.

The entire development, as shown in the general plan layout, will comprise three large piers ranging in length from 830 to 1150 ft., extending out from the warehouse area which will contain four groups of warehouses, each one of which contains two twin units separated by fire walls. The twin units are of identical design built around a central railroad, with rail approaches on both long sides. Now under construction is Pier C, the most southerly of the three piers and one unit warehouse comprising the twin structures noted on the plan as Nos. 5 and 6. In addition, the main bulkhead extending along the whole front of the property has been built.

The water line at the site when taken over extended up into the future warehouse area. The bulkheads are typical New York timber construction extending 1200 ft. along the front of the property and the shore-end area filled up to grade with an ash fill. The pier, as shown on the drawing, is 830 ft. long and 130 ft. wide. It has throughout a timber substructure composed of transverse wooden pile bents carrying transverse timber stringers and a 10-in. reinforced-concrete slab. Details of the construction are shown on the accompanying drawings. They are of the simplest possible form consistent with strength. It will be noted that special reinforcing of the timber work occurs under the railroad track which runs out on the pier, and that there is thorough transverse cross-bracing. Longitudinal bracing is provided for by the railroad stringers and by the side caps and rangers over a central 12 x 12-in. brace running the length of the pier. The outer corner of the piers are protected by clusters of piles tied together with chains. The concrete slab is reinforced as shown in one of the drawings, and carries in addition to the 10-in. thickness, a 2½-in. surface of asphalt. According to the specifications, the concrete slab is to be laid in alternate strips corresponding in width to the distance between center lines of the pile rows.

In view of the attention given to the fire protection of terminal piers, it is interesting to observe that the pier shed is of timber semi-mill construction. It has been so designed, however, and so provided with sprinklers and fire-protection mains as to make possible an insurance rate as low as that on similarly protected steel piers.

Drawings show the details of the shed. It comprises triangular wooden trusses, resting on H-beam steel columns spaced 20 ft. c. to c. The roof has on each slope two rows of skylights, each 6 ft. 9 in. by 8 ft. in area,



ONE PIER AND A TWIN WAREHOUSE OF POUCH TERMINAL ARE NOW BUILDING

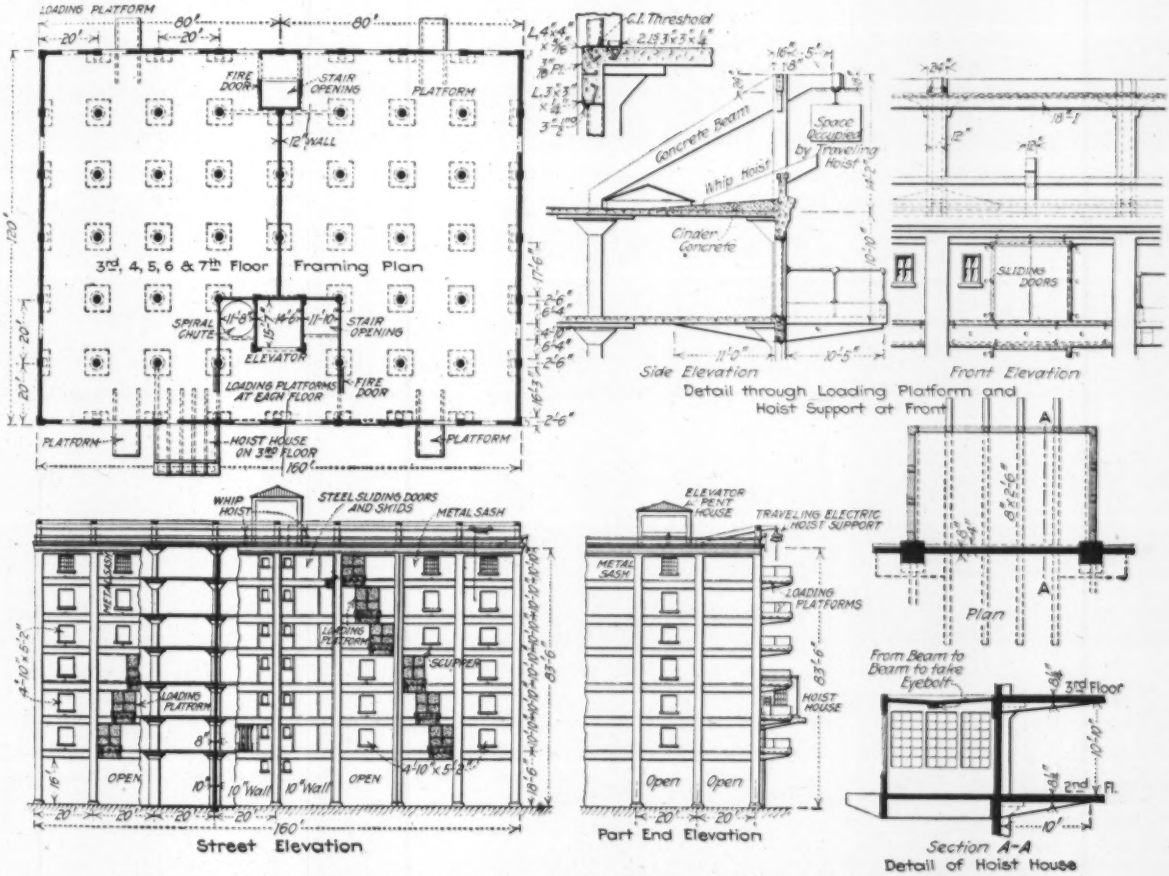
the rest of the roof surface being of a composition slate material laid on roofing boards. The sides of the shed are wooden iron-clad doors, running on track along the entire length of the shed, one door in every other 20-ft. panel. The sheathing where there are no doors, is of corrugated galvanized iron on yellow pine studding. There being only one line of center columns, the shed area is especially spacious for handling large cargoes.

A special roof drainage device is provided in the way of flashing near the roof eaves. This centers at each column and rises up the roof on a straight line to meet between the columns at 2 ft. above the eaves. Water coming down the roof is intercepted by the flashing and is led to the columns, where it runs down the channel riveted to the outside of the H-beam post, thereby elim-

inating the risk of damage from inside leaders of old type.

On both sides of shed, between stringers and sheathing, there is an open space or driveway of 9 ft. which serves a double purpose, of allowing large packages of freight to be handled, to and from steamers, without injury to shed, and for additional access to the pier for small electric trucks and tractors without entering the pier shed, thus reducing congestion of inside driveways. The railroad track is located inside of shed to permit of loading cars in stormy weather. A spacious office for steamship clerks has been provided at the shore end of pier, at an elevation of sufficient height to permit of a general view of entire length of pier shed, thus giving men in charge full supervision over every detail of adjoining street and railroad tracks. The railroad tracks do not enter this floor, but run immediately alongside on both the bulkhead and inside front of the building. This open space, which is paved with concrete, permits the quick temporary storage of material brought in by trains and trucks, for which there is not sufficient time or in which the congestion is too great to permit immediate elevating to the other floors of the building. It serves likewise for storage of material brought down from the warehouse to be taken away.

The floors themselves have several entrances. The principal of these entrances are the doors opening from each floor to cantilever platforms overhanging both fronts of the building. These platforms, as will be noted, are staggered up the face of the building and are



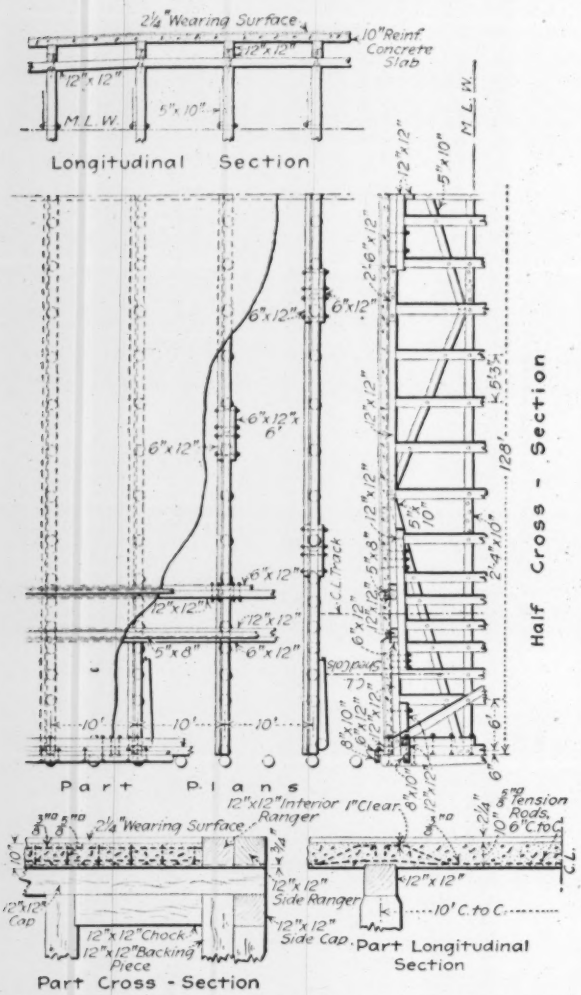
CONCRETE TERMINAL WAREHOUSE HAS MANY NOVELTIES IN FREIGHT-HANDLING METHODS

operation. The electric lighting system will be of the latest design to meet the requirements of modern steamship methods.

The two units of the warehouses now being built are in effect one building, separated through the center by a fire-wall. They are throughout of reinforced concrete using Havemeyer bars. The whole structure is 120 x 160 ft. in plan and seven stories high. A four-way flat-slab floor known as the Simplex system of design, is used throughout with circular interior spiral columns and rectangular exterior columns, the curtain walls being of concrete. Each of the column footings rests on MacArthur pedestal concrete piles.

The layout of the building is extremely novel. In the first place the whole first or ground floor is open to the controlled by a traveling electric hoist which runs along a reinforced-concrete cantilever extending out from the roof of the building. Material to be brought in can be placed alongside of the railroad tracks or left in the open trucks or cars and elevated by means of these traveling hoists to the extending platform, whence it can be rolled at will inside to any section of the floor.

In addition to this means of entrance, there are up the middle of both faces of the building, that is in the two middle panels, wide openings in which are sliding doors. The material to be brought in through these doors is lifted by whip hoists attached to permanent brackets immediately above the two central panels. These hoists are to be controlled from the ground in the usual manner. The traveling electric hoist will



PIER GOOD EXAMPLE OF TIMBER CONSTRUCTION WITH CONCRETE FLOOR

when the building across the way is completed, be controlled from an extended platform at about the second story of that building. Pending the construction of an opposite building, the traveling hoist on the first unit will be controlled from a temporary house on the ground, directly opposite the front of the building. Meanwhile, a similar platform has been built on the inside face of the structure now under way from which the hoists on the opposite building will be controlled. This method has been developed because it insures the operator seeing all of the operations. If he is working from the building into which the material is being hoisted, his view is often obscured.

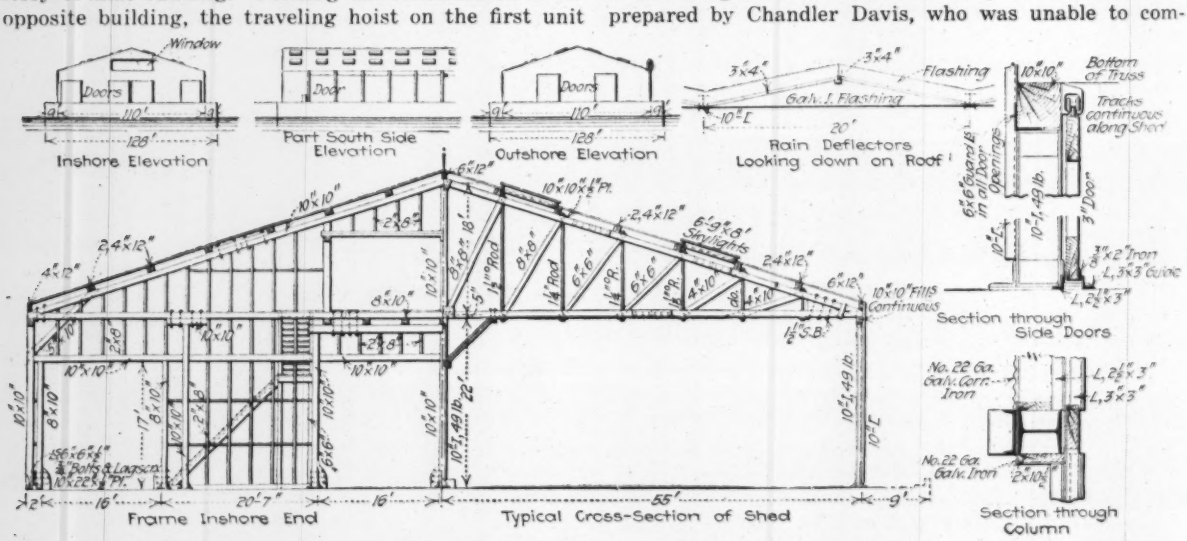
Another entrance to the floors is had by an elevator in the front part of the building, which, it will be noted, is completely inclosed with a fire-wall opening into each of the two halves of the unit. This separated section has also a stair opening and a spiral chute for lowering freight from any of the floors. In addition, there is a further stair opening in the rear of the building, also separated by fire-walls.

The explanation for such a variety of mechanical equipment is given in the statement that the commodities to be handled in these warehouses vary so much, in size and weight, that three independent methods of elevating and four of lowering are necessary to obtain the proper efficiency of modern methods, especially when freight must be handled simultaneously in and out of warehouse, from trucks, lighters, cars and piers.

The elevator will be of sufficient size to carry two electric trucks, each holding two tons of freight, while whip hoists of higher speed will have a capacity of only one ton. The overhanging platforms are so arranged as to permit of electric trucks being operated from each floor, independent of elevator or whip hoist service. The spiral chute will be of special design and size to provide for speedy delivery of package freight where other methods are not required.

The Pouch Terminal is under the immediate direction of A. B. Pouch, president of the American Dock Co., New York City, who is responsible for many of the details which have been worked out from ideas of efficiency he has gained by years of practical operation of terminals and a close study of port facilities at home and abroad.

The designs for the bulkhead and pier were originally prepared by Chandler Davis, who was unable to com-



PIER SHED IS OF WOOD THROUGHOUT

plete his plans on account of being called to Government service. W. J. Barney, consulting engineer, New York City, completed the details and supervised the work started by Mr. Davis. The bulkhead was constructed by the General Contracting & Engineering Co. The pier itself is being built by Anderson & Wheeler of St. George, Staten Island. The plans for the first unit of warehouses were prepared by Alex. Thomson, Jr., chief engineer of the Concrete Steel Co., of New York City, and the general contractor for the building is the Fairibault Building Corporation, also of New York.

Eight-Inch Hardwood Rollers Take 12 to 18 Tons per Foot

Maple, Sycamore and Oak Tested—Quarter-Cut Rollers Prove Stronger Than Pole Rollers—Safe Loads Recommended

BY A. B. MCDANIEL

Professor of Civil Engineering, Union College, Schenectady, N. Y.

WOODEN rollers have been used since the days of the ancients in moving heavy loads, and are in general use today, for supporting excavating machinery on wet soils, and for other purposes. Very little has been known as to their strength. The tests described were made to furnish data on this subject.

The rollers were hand-hewn out of small timber, and were painted with one coat of red lead. Three 8 x 36-in. specimens of each of the following kinds of wood, hard maple, burr oak, sycamore, and pin or water oak, and one 6 x 36-in. specimen of birch (thirteen specmens in all) were tested.

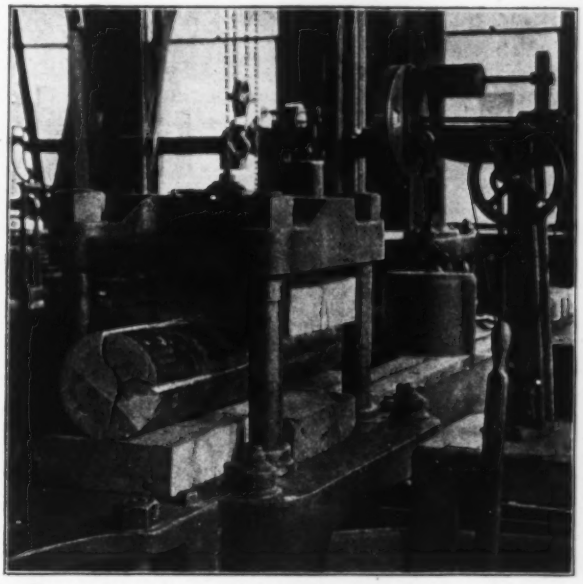
All the rollers were furnished by R. H. and G. A. McWilliams, drainage contractors of Chicago, and were of the type used by them for the support of dragline excavators. The tests were made by the writer under the general supervision of Prof. H. F. Moore, in the Materials Testing Laboratory of the University of Illinois.

Each roller was tested for static-compression strength in a 200,000-lb. standard testing machine. The specimen was bedded on three short 4 x 12-in. oak planks laid transversely, and the load was applied through a single similar transverse plank on top of the roller. Thus only the middle 12-in. length was loaded, while the roller was bedded on its whole length. The load was applied at the rate of 0.1 in. per minute, and readings of the vertical motion of the bearing head were taken at each 5000 lb. Observations were taken of the load which produced an initial crack in the specimen, the character and location of further cracks under increased loads and the method of final failure.

The results of the tests, briefly tabulated herewith, show the following noteworthy facts:

Ten specimens which were "pole" pieces, or rollers cut from trees just large enough to make one piece, failed by shearing vertically, the final break passing through the heart of the section. Specimens 2, 12 and 13 were "quartered" pieces and the load was applied in the general direction of the grain. In these the initial crack was horizontal and extended across the section near its center; further application of the load produced a considerable spreading of the specimen, and final failure occurred at a load 30% to 50% greater than that required to crush a "pole" roller.

The hard maple and sycamore rollers had about the same ultimate strength. The burr oak and pin oak rollers showed about 40% greater strength.



ROLLER AFTER CARRYING NEARLY 45 TONS IN THE TESTING MACHINE

These tests were too limited in scope to furnish conclusive results, but it is believed that they do furnish suggestive information as to the strength of rollers. This series of tests was made under static loads, and it is evident that under moving loads the specimens would have failed under lower loads. The writer has

DIFFERENT KINDS OF FAILURE EXHIBITED BY THE VARIOUS ROLLERS TESTED

observed that in moving a dragline excavator the front roller of a group crushed just as the machine began to move. It is probably true that the greatest pressure on a roller will occur at the commencement of motion.

Hence, in selecting the safe load for rollers a large factor of safety should be applied to the static strength results.

Assuming a factor of safety of 10, the following are suggested as safe loads for "pole" rollers of 8-in. diameter:

Hard sample Sycamore	2,500 lb. per lin.ft.
Burr oak Pin oak	3,500 lb. per lin.ft.

CRUSHING TESTS OF 8-INCH WOODEN ROLLERS

NOTE.—All rollers were 8 in. diameter, 36 in. long, except for variations in diameter noted. Load was applied over the middle foot of the 3-ft. length.

	Material	Weight Lb.	Load at First Crack Lb.	Ultimate Load Lb.	Average Ultimate Compr. Load per Foot of Length, Lb.	Under Ult. Load In.	Method of Failure
1	Hard maple	54 25	70,000	72,000		1 1/16	Vert. Shear
2	Hard maple	50 00	114,000	*125,000	25,670	1 1/2	Horiz. Shear
3	Hard maple	52 50	75,000	82,000		1 1/4	Vert. Shear
4	Sycamore	41 50	45,000	80,000		1 3/16	Vert. Shear
5	Sycamore	46 00	30,000	61,800	24,630	1 1/16	Vert. Shear
6	Sycamore	40 50	40,000	80,000		1 3/16	Vert. Shear
7	Burr oak (8¼ in.)	67 00	80,000	107,000		1 3/16	Vert. Shear
8	Burr oak	64 00	50,000	111,700	35,200	1 3/16	Vert. Shear
9	Burr oak (8¼ in.)	73 50	40,000	98,000		1 1/8	Vert. Shear
10	Pin oak	65 75	No record	97,000		1 1/16	Vert. Shear
11	Pin oak	65 50	60,000	119,000	36,000	1 3/16	Horiz. Shear
12	Pin oak (8¼ in.)	67 50	†80,000	*134,000		1 3/16	Horiz. Shear
13	Birch (6 in.)	28 00	†25,000	80,000		2 3/16	Shear

* Quartering pieces. Results not used in computing the average, which gives the result for vertical shear failure.
† Quartering piece.

Local Interests Have Obligation in Waterways

In a letter to Secretary of War Baker, the Hon. John H. Small, Chairman of the Committee on Rivers and Harbors of the House of Representatives, calls attention to the necessity of local agencies furnishing a considerable contribution to the increase of waterway transportation. The letter says it is self-evident that the mere deepening of an entrance to or the increasing of the depth and area of a harbor, or the improvement of a channel of an interior waterway, will not alone establish water transportation. However, these are the only things that the Federal Government can do. They simply provide the basic necessities, but there are additional facilities which must be provided for the establishment of the method or system of communication. First, there must exist the demand for the movement of products; second, there must be water terminals physically connected by belt-line railway and railroads serving the community, or with highways radiating therefrom, and equipped with proper handling machinery; third, there must be established lines of water transportation with sufficient capital and organization; fourth, there should be complete coördination between the water transportation lines and the railroads. It is the opinion of the members of the House Committee that all of these things must be provided by the local interests, either the states or the municipalities. The committee feels that unless the states and municipalities enter into the provision of such facilities to a much greater degree than they have in the past the Federal Government cannot be expected to continue to provide the basic water facilities—that is, the channels and harbors.

Floating-Crest Gates Used on Sherburne Lakes Dam

Automatic Movable Crest, with Radial Top Plate and Cylindrical Downstream Plate, Is Devised for Isolated Site

TO MEET the requirements for the safety of the earth dam at the Sherburne Lakes, on the Milk River irrigation project of the U. S. Reclamation Service, in Montana, and to satisfy the demand for a large reservoir capacity, a freeboard of 10 ft. was stipulated—this to exist during stages of maximum flood, as well as of maximum storage. This necessitated a movable crest. As the reservoir was in the mountains far from human habitation, it was deemed unsafe to put sole reliance on the services of a gate tender. Automatic gates were necessary—gates that would be simple in mechanism, reliable in operation and sensitive in regulation of the maximum storage level. The type selected is a sector, hinged upstream, with a radial top plate and a cylindrical downstream plate, with a longitudinal seal both for this plate and for the line over the hinges, and with end seals at the pier faces. A joint patent on this form of movable crest will be taken out by Gen. W. L. Marshall and F. Teichman, of the U. S. Reclamation Service. The device is described by Mr. Teichman as follows:

For an assumed height of 5 ft. of this crest it had to have a length of 160 ft., to accommodate the maximum flood. This length was divided into four unit crests of 40 ft. each. Each 40-ft. crest unit is made up of two identical halves, 20-ft. long, connected, just within the cylindrical plate, by a tangential link which forces both halves to move together but gives to the sectors a certain freedom in expansion and in motion, affords greater ease in alignment and installation, and avoids field riveting. Each 20-ft. sector has a central air-tight caisson of such flotation, in submergence, that its moment relative to the hinge axis exceeds the moment of the weight of the sector.

Pipe systems, one located in a chamber of each abutment and two in a chamber of the central pier, and each connecting with the pit in which its sector moves, furnish the means for the operation of the four sectors. A siphon (under a patent of General Marshall) is made a part of each pipe system and furnishes the automatic principle of the mechanism.

As long as the pressure of the water below the sector (in the pit) corresponds to the level of the water above, the positions which the sector assumes, as the reservoir level rises to that of the permanent crest and then above it until the sector reaches the stops for its highest position, are with the apex above water level; and the positions are the same as if the water downstream from the sector stood as high as upstream (because the water pressures on the cylindrical plate of the sector do not affect the equilibrium of the sector). This is also true of the stop forces for the higher reservoir levels.

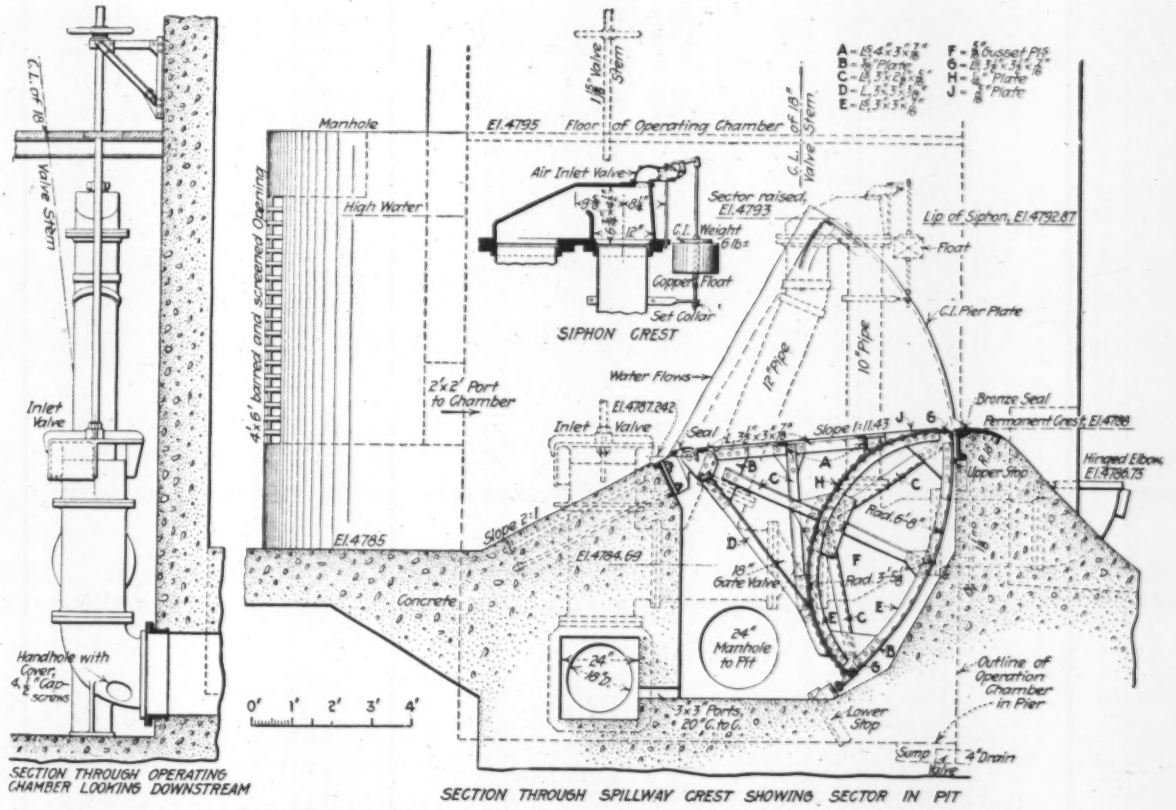
For any of the positions through which the sector passes as it lowers, in flood, from its highest position under action of the siphon, or as it rises, against the flood waters, from lowest to highest position when the action of the siphon is broken, there exists a certain

"reduction" (of pressure underneath the upper plate) for which the sector is in equilibrium. For the Sherburne sector as designed, this reduction is 5 in. for the lowest position, 6¼ in. for the highest position of sector and 6½ in. for a position about 15° from the highest position. This variable reduction represents the force available for raising the sector, when, after release by the automatic break of siphon, the sector moves upward through the flood waters; and it may be said that these available forces have a variation similar to that of the resistances; the mechanical friction is the highest for highest position of sector, diminishing as the sector lowers (because the hinge reactions vary in that manner) and the hydraulic resistance (the impact of the approaching flood waters) is greatest for mean positions of the sector. A 5-, 6¼- or 6½-in. reduction repre-

For automatic action the gate valve is closed, the intake valve adjusted to a certain position, and the float placed so as to break the siphon when the flood level by a temporary opening of one or more crest units has been lowered to a certain predetermined elevation.

Let S be the sum of all pit leakage, having the positive sign if the leakage out of the pit predominates, let Y be the water discharged by the siphon, and D the displacement, that is, the flow per second into or out of the pit due solely to the up or down movement of crest and let Q be the water passing the intake valve.

For automatic down movement of crest, Q equals $S + Y - D$. While the sector is being held in down-position for passage of flood waters Q_1 equals $S + Y$ and when the sector rises after break of siphon Q_2 equals $S + D$. While Q_1 passes the intake valve the loss



NEW AUTOMATIC CREST GATE IS OPERATED BY AIR-TIGHT CAISSON AND SIPHON

sents a tangential force, with radius of 6 ft. 8 in. (that of the circular plate), of 87, 108 and 113 lb. respectively, per lin.ft. of sector. These forces are larger than required. They should be large enough to move the sector against friction and hydraulic resistance and to keep the sector in highest position and against the stops when under wave action, but any great excess above that merely exaggerates the stresses at hinges, at stops and in the sector itself. The tight caisson of the sector is provided with a drain pipe to carry its leakage. This pipe has a short extension into the caisson by means of which a certain amount of water is always retained in the caisson. In this manner the available force for moving the gate upward or for holding it against the upper stops can be made anything less than the above given values that may be desired.

of head is somewhat larger than the reduction of equilibrium, and for passage of Q_2 the loss of head is somewhat smaller than this reduction of equilibrium. Therefore $Q_1 > Q_2$ and if the displacement for up-motion of crest is to be about the same as for down-motion (D having the same value in expressions for Q_1 and Q_2) then it follows that $Y > 2D$. The effective head of siphon being known, and the efficiency of siphon being assumed (40 to 50%), Y may be figured, then D assumed, and, for certain assumption of S, the values of Q_1 and Q_2 may be known. Also the adjustment of the intake valve may be assumed which for the passage of Q_1 and Q_2 produces certain required friction losses. The final adjustments can be made only under actual test. The expression for Q_2 will lead to the determination of the reduction (considerably larger than that of equilib-

rium) which obtains (for the intake valve adjusted for Q_1 and Q_2) while flood waters pass the crest in a down position.

If a certain adjustment of valve does not give the desired relation between rate of up-motion and rate of down-motion of the sector then this adjustment is changed. For instance, by opening the valve wider the quantities Q_2 and Q_3 increase, since the friction losses of passage through valve must remain unchanged. The values S and Y also remaining practically unchanged, it follows that the displacement for down-motion must decrease and for up-motion must increase. Thus, if desired, the rates of up and down motion of sector can be equalized. This uniform rate of displacement is somewhat smaller than half the discharge of the siphon, and if this rate should be greater than desired it is corrected by placing a light steel disk with reduced orifice between the flanges of the up-leg or down-leg of the siphon or both, thus reducing Y and thereby D.

Of course, the crest can be operated at the will of the attendant and without the siphon action by the use of the intake valve and the gate valve.

The outlet of the pipe system is so located that, for any elevation of water level in the reservoir between permanent crest and apex of movable crest in highest position, the apex of crest will be higher than the water level. If it is desired to discharge over the permanent crest with reservoir levels only slightly above this crest it is necessary to raise the hinged discharge elbow.

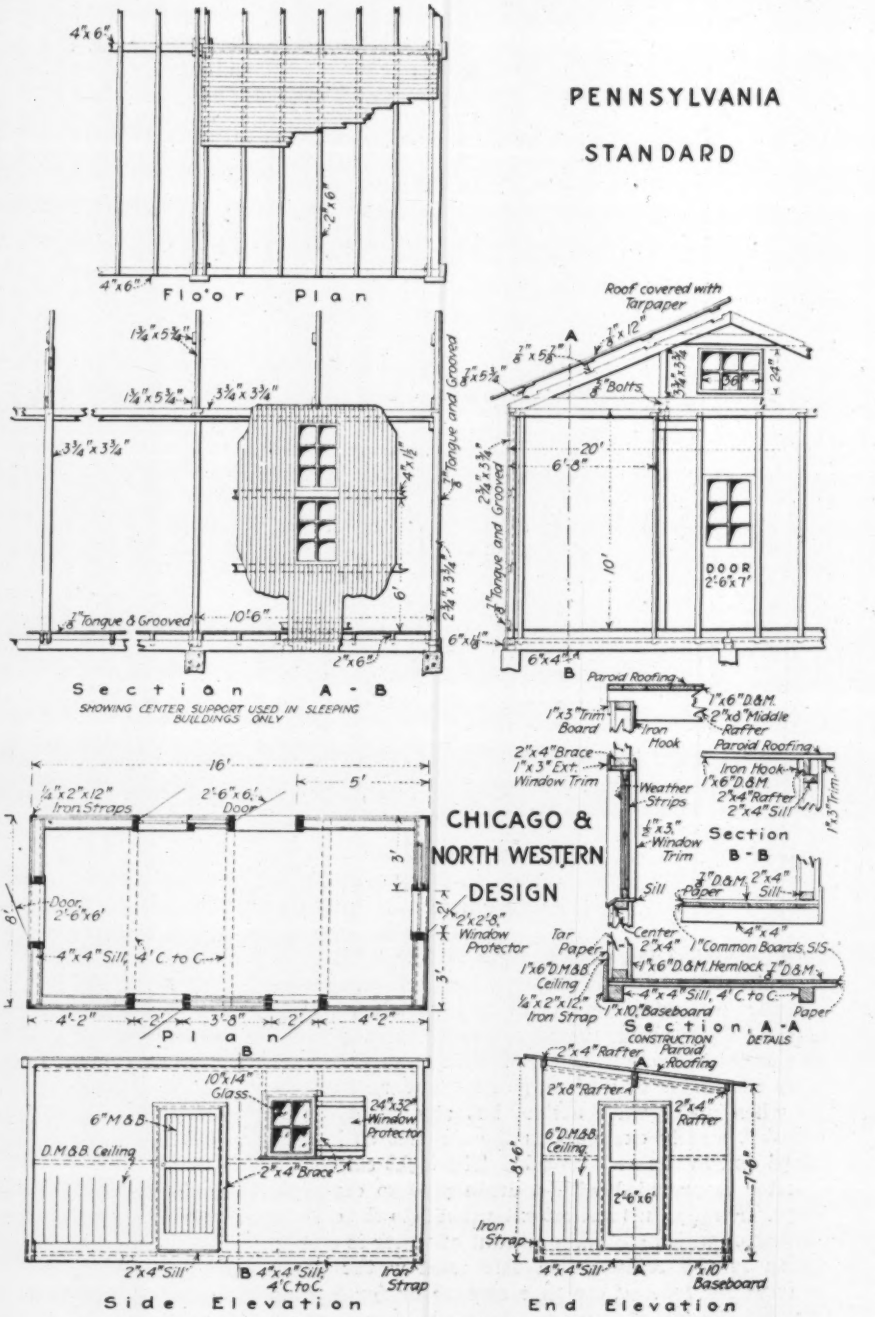
Sewers Cleaned After Trees Had Been Cut

After sacrificing some large and handsome shade trees in an attempt to prevent sewer clogging by roots, without stopping the trouble, the City of Goshen, Ind., had the roots and other débris removed by the Turbine Sewer Machine Co., Milwaukee. After the trees had been cut down an unsuccessful attempt was made to kill the roots by boring holes in the stumps, pouring in acid, and plugging the holes.

Portable Units Form Buildings for Labor Camps

Sectional Bunkhouses More Convenient and Sanitary Than Box-Cars or Shacks—Cost 7½ Cents per Cubic Foot

BUNKHOUSES and other camp buildings of sectional knockdown construction are being introduced for the accommodation of workmen on construction jobs and railway maintenance, and in many ways are considered



COMPARATIVE DETAILS OF PENNSYLVANIA AND CHICAGO & NORTH WESTERN DESIGNS FOR PORTABLE CAMP BUILDINGS

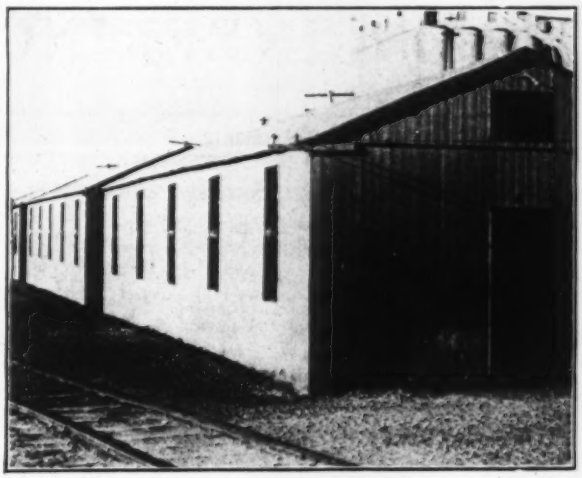
an improvement upon the common method of housing the men in old box-cars or rude shanties. The standard design adopted by the Pennsylvania R.R. for wooden buildings of this sort is shown herewith, and was referred to in *Engineering News-Record* of Nov. 1, p. 832. Details are also shown of a type used by the Chicago & North Western Railway.

The Pennsylvania buildings are of light framing, with sheathing of tongued-and-grooved white pine, and roof panels of plank covered with tar paper. They are built in 10½-ft. lengths, and have a uniform width of 20 ft. and height of 16 ft. from floor to ridge. The exterior is covered with pebble-dash roofing paper. For semi-permanent structures, as at railway shops, the floors are set on concrete piers about 18 in. above the ground, and roof gutters and downspouts are provided.

Typical construction is shown by the drawing, and the views show exteriors and an interior at camps near Philadelphia. The buildings can be made of any desired length, and equipped for various uses. The bunkhouse has usually five sections. It has steel double-deck bunks, and is fitted with lockers and stationary washstands supplied with running hot and cold water. Shower baths are provided whenever possible. A 73½-ft. mess-room has two sections (21 ft.) for the kitchen, and five sections (52½ ft.) for the dining room. This latter has six rows of benches and two tables. The commissary building for the storekeeper or timekeeper has two sections.

Portable sectional buildings of simple construction, intended generally for maintenance-of-way and extra

DOUBLEDECK BUNKS AND STATIONARY WASH BOWLS IN HOUSES



PENNSYLVANIA STANDARD BUNKHOUSES HAVE GABLE ROOFS

gangs, have been designed by J. S. Robinson, division engineer of the Chicago & North Western Ry. These are in separate units 8 x 16 ft., 7½ to 8½ ft. high, as shown.

Transverse sills spaced 4 ft. on centers carry a double floor composed of two layers of planks with tar paper between them. The sides have sills and girts, with 1-in. sheathing inside and outside and tar paper behind the outer sheathing. The rafters are notched to fit over the sides and act as braces. The roof has a single layer of plank covered with roofing felt. The design is simplified by the use of a shed roof instead of the gable roof of the Pennsylvania design. Doors, windows and shutters are provided as shown.

Sides, ends, floor and roof form separate sections or panels. These are packed flat for shipment, and material for four buildings can be transported easily on a flat or gondola car. When erected, the sections are put together with hooks and eye-screws. The separate panels are readily treated with disinfectants, applied by brush or spray, and this work is easier and more effective than disinfecting a car. Cost of construction is about 7½ cents per cu.ft. Unloading and erecting costs about $5 per unit, dismantling and loading the same.

Each unit used as a bunkhouse will accommodate eight men, and the arrangement facilitates the provision of separate quarters for men of different colors or nationalities. The buildings may be equipped as kitchens, mess rooms, storehouses and offices. They can be erected at any suitable site, without the necessity of building spur tracks, and their transportation requires no special train service.

Canadian Provinces Connected by New Road

The provinces of Alberta and British Columbia have recently been connected by a road following the route to the south of Crows Nest Lake, which has resulted in abandoning the old road over the summit at Crows Nest Pass. The new road passes by easy grades over the summit of the Canadian Rockies, on the boundary line between Alberta and British Columbia. In addition to this, there are now a number of projects throughout the Kootenay District in British Columbia which are under construction.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Structural Design Simply Stated

Reviewed by WALTER S. EDGE
Consulting Engineer, 42 Broadway, New York City

PRACTICAL STRUCTURAL DESIGN: A Textbook and Reference Work for Engineers, Architects, Builders, Draftsmen and Technical Schools; Especially Adapted to the Needs of Self-Tutored Men—By Ernest McCullough, C. E., M. Am. Soc. C. E. New York: U. P. C. Book Co., Inc. Cloth; 6 x 9 in.; pp. 303; illustrated. $2.50.

The author has produced a clearly written, concise treatise dealing with the practical side of structural design, suited to the working student whose knowledge of mathematics does not extend beyond arithmetic. This summarizes the work but does not do it justice.

If in our college days one of us had dared to tell our professor of mechanics or structures that a really comprehensive text could have been written without the use of calculus or algebra, he would certainly have been classed with the heretics. The writer has always felt, however, that such a thing could be done and now his belief is realized in Mr. McCullough's admirable work.

As is true of several other successful technical works, this book is an outgrowth of a teaching course given by its author. A large part of the subject matter was given in a series of articles which appeared in the "Building Age" in 1914.

In the preparation of any course of instruction the teacher must draw heavily on other published texts, so naturally much of the material here presented will be familiar to experienced readers. Two circumstances differentiate this from the general run of books and tend to explain its special merit. The first is that the students in the night school for whom the original material was prepared were drawn largely from the ranks of draftsmen in the offices of engineers, contractors and "material men" who were eager for the knowledge which would enable them to better their condition but who would be discouraged by the effort required to obtain this knowledge through the language of higher mathematics. The second is that the author took up teaching as a relaxation from the busy life of a practicing engineer and for that reason approached the problem far better equipped in a practical way than the great majority of the authors of our textbooks.

Although containing only 293 pages, it is difficult to find a phase of structural engineering such as is likely to be encountered in the city practice of a designing engineer which is not covered in a satisfactory manner.

Particularly interesting and instructive are the passages which deal with the relation of the engineer and the building departments of our larger cities. This is a subject which most texts ignore entirely or give but passing attention. As a result many men come from college with but a hazy idea of what a building code means. They are apt soon to discover, however, that it is a very real though, in some cases, arbitrary law which must be obeyed.

The reviewer believes that technical and trade school teachers, both night and day, will find this book a very real help to them in their work, either as a text or as a guide and inspiration. In his own engineering practice the reviewer is using the book as a reference work. He finds that, on account of the clearness and simplicity of the explanations given it has met with favor at the hands of designing engineers who have used it.

Timber-Frame Construction

TIMBER FRAMING—By Henry D. Dewell, Assoc. M. Am. Soc C. E.; Structural Engineer for Alaska-Yukon-Pacific Exposition; Chief Structural Engineer for Panama-Pacific International Exposition. San Francisco, Calif.: Dewey Publishing Co. Cloth; 6 x 9 in.; pp. 275; illustrated. $2.

War-time needs have brought timber-frame construction to a position of importance comparable to that of three or four decades ago. At the same time they bring into view the lack of good engineering knowledge concerning design in timber. Construction that violates one or another or several principles of sound designing is common. Now the necessity is again opening our eyes to the merits of timber-frame construction we are coming to appreciate the importance of studying details in wood with greater care. Mr. Dewell's book furnishes an indispensable help in this direction.

We are likely to overlook the immense contribution made to timber construction through the several large expositions of the last fifteen years. The Panama-Pacific may probably be credited with much of this contribution, and, in turn, Mr. Dewell, as its chief structural engineer, is entitled to a large share of the credit. Substantially all the experience that that great enterprise yielded, together with some important auxiliary testing, is brought together and applied to practical use in the present book.

To begin with, the author shows a healthy spirit of caution and conservatism in his discussion of unit stresses. Not that he goes to the extreme of the old-time flat 1000-lb. unit stress, but his emphasis on the influence of ordinary defects and variations of quality leads him to give warning against indiscriminate use of the maximum unit stresses that have been recommended for high-grade bridge timber. Even more commendable caution is shown in a recommendation to modify allowable units according to the nature of the detail of the joint.

The treatment of the elements of joints, and then of various types of joint themselves, is of a kind adapted to build up the user's knowledge of timber construction on a new and fruitful basis. Here are brought together the essential contributions made by the large expositions.

The rest of the book—the last third—is also of value, but, dealing more broadly with elements of timber frames, it is less exhaustive than the portion that precedes. Here we find warning against longitudinal shear in dry timbers, for example, but no quantitative estimate of the amount of weakening that should be allowed for by the prudent engineer. Again, we find

reference to bracing trusses, but no such full treatment of the bracing of timberwork as the complexity and trickiness of the subject might demand. The relation of timber design to decay and to fire danger, and a number of other matters of general bearing, fail of mention or at least of full treatment, which in a measure deprives this last part of the book of the treatise character.

In general, it must be said that the book is absolutely indispensable to everyone intending to design in timber. It leaves the reader with a feeling, moreover, that further books will be written in future on the subject of timber design—and this last is evidence of the high quality of the book.

From Coal Pile to Flywheel

STEAM POWER PLANT ENGINEERING—By George F. Gebhardt, M.E., A.M. Professor of Mechanical Engineering, Armour Institute of Technology, Chicago, Ill. Fifth Edition. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 1057; illustrated. $4.

Lengthy and appreciative reviews of the first and the extensively rewritten fourth editions of this book appeared in these columns Nov. 12, 1908, p. 534, and Nov. 13, 1913, p. 1000. In one of these notices the book was characterized, in effect, as an encyclopedic treatment of its subject from the coal pile to the flywheel.

Through the medium of his preface the author states that the same general treatment has been followed in this as in the earlier edition. Besides laying particular stress upon fuels and combustion, supplementary chapters have been supplied on elementary thermodynamics, properties of steam and properties of dry and saturated air. With these and other changes and additions, the scope of the work has been greatly enlarged and, except for "a few minor sections, the entire text has been rewritten." Further studies of the subject are "facilitated by numerous references to current engineering literature"—a most commendable feature.

Author and publisher alike are to be congratulated upon their continued and successful prosecution of the large task of keeping so comprehensive a book as this one up to date.

Hydraulic-Mining Debris

HYDRAULIC-MINING DEBRIS IN THE SIERRA NEVADA—By Grove Karl Gilbert, Washington, D. C.: The Superintendent of Documents. Paper; 9 x 12 in.; pp. 154; illustrated. 50 cents.

Based principally upon field work done from 1905 to 1908, but supplemented with later observations down to 1914, this monograph deals chiefly with the geologic and physiographic aspects of the hydraulic mining débris problem in the Sacramento and San Joaquin valleys. When the matter was referred to the U. S. Geological Survey in 1904 it was proposed that a threefold study should be made to include field work, laboratory investigations, and the engineering study of the débris problem. A report on "The Transportation of Débris by Running Water, Based on Experiments Made with the Assistance of E. P. Murphy," was published by the author of the present monograph as Professional Paper 86 (1914) of the U. S. Geological Survey. The contemplated engineering studies were never made owing to the fact that the Reclamation Service was separated from the Geological Survey and made a bureau of the Department of the Interior in 1906.

Mr. Gilbert's monograph opens with a review of hydraulic mining in the Sierra Nevadas. It then deals with the encroachment of débris on valley lands, land subsidence, changes in conditions of the rivers from artificial causes, changes in the conditions of the bays receiving the river discharges, the quantity and distribution of detritus, specific detritus studies in the lower Yuba River, including an account of the barriers built there and the results they gave, flood control, the relations of the débris movement to the Golden Gate bar at the entrance to San Francisco harbor, and finally the outlook for hydraulic mining.

Originally a conflict between the interests of the hydraulic miners above and the agriculturists and town dwellers on the lower levels, the questions at issue are now more particularly between those who wish to use water for hydraulic mining and for hydroelectric power on the one hand, and on the other the agricultural and commercial interests centering in the marshlands now being reclaimed around San Francisco Bay and in San Francisco Bay and harbor as a shipping center. Summarizing, Mr. Gilbert says:

"The stress which caused the restriction of hydraulic mining no longer exists. Under conditions to be created by works for the control of floods the capacity of valley rivers for transportation of débris will be increased, so that mining might be partly resumed without prejudice to any valley interest except navigation. The important interest which now dictates that débris should be controlled is that of the commerce which traverses the Golden Gate. The possibilities for resumption of mining on a large scale, with storage of débris, lie in coöperation with irrigation and electric power development for the control of Sierra streams."

Folwell's Water-Supply Rewritten

REVIEWED BY GEORGE W. FULLER
Consulting Engineer, 170 Broadway, New York City

WATER-SUPPLY ENGINEERING: The Designing and Constructing of Water-Supply Systems—By A. Prescott Folwell, Member of the American Water-Works Association. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; 6 x 9 in.; pp. 484; illustrated. $3.50.

It is 18 years since the first edition of this book appeared. The present edition has been practically rewritten so as to make it essentially a new book. The chapters on water purification and the quality of water have been entirely rewritten and much elaborated, occupying now nearly 80 pages. The chapter on pumping machinery, 66 pages, has also been rewritten. The size of the book has been kept within moderate limits by the complete omission of the chapter in earlier editions dealing with maintenance and by condensing the earlier chapters on construction to about 20 pages.

The book is written in excellent style with a clearness and directness that assures its success in the hands of students and of those practitioners desiring the essential evidence on the more important phases of water-supply engineering. Although not intended for him the specialist will find the book of considerable interest for general reference.

The fundamental principles of water purification by means of sedimentation, filtration, coagulation, chlorination, and treatment with other chemicals, are set out with unusual clearness. Up-to-date means of applying chemicals are described at length, although very little

attempt is made to describe other than their more general features

The broad viewpoint of what constitutes good water-supply engineering is recited in an admirable manner and the reader is not left in doubt as to what constitutes a good supply, reasonable in quantity and quality. The methods of investigating the quantity and quality of a proposed supply from ground-water and surface sources, are made plain both as regards the yield and quality of water to be expected therefrom.

A good chapter of 24 pages is given on rainfall. The effect of evaporation on storage is explained, both in its relation to surface supplies and ground-water sources.

The superintendent will find interesting data as to the waste of water, requirements of the underwriters as to water-supply for fire protection, variations in the consumption at different hours of the day for different seasons of the year, and the factors to be considered in forecasting future consumption.

Taken as a whole, the book makes a very favorable impression, and should prove to be of distinct value to all students and practitioners interested in water-supply engineering.

A Brief for Private Ownership

A MUNICIPAL EXPERIMENT, OR THE HALL OF RECORDS POWER PLANT—By Reginald Pelham Bolton. New York: The Bureau of Public Service Economics, Inc., 55 Liberty St. Cloth; 5 x 8 in.; pp. 221; illustrated. $1; $1.10 postpaid.

Regarded as a brief for private rather than municipal ownership, and for central rather than isolated station electric light and power and steam heating plants, this is a commendable piece of work. The author has presented in small compass and readable form a digest of a large volume of material on the cost of installing and operating the lighting, heating and elevator-service plant for the New York City Hall of Records and some near-by buildings. The original documents in the case were the result of an agreement between the Borough of Manhattan, the Department of Water-Supply, Gas and Electricity of New York City, the New York Edison Co., and the Bureau of Municipal Research to make a study and test of the plant named. The operating test was made in 1913. Mr. Bolton was one of the "engineers charged with the duty of conducting" the test. He presents a concise summary of the nature and result of the test and makes skillful use of the data to show up this "municipal experiment" in a bad light. To what extent he could be answered by a brief for the municipal ownership side, we do not pretend to say. Certainly, the evidence as he presents it is not favorable to municipally-owned isolated stations.

Sanitary Classics Made Available

STATE SANITATION: A Review of the Work of the Massachusetts State Board of Health—By George Chandler Whipple, Professor of Sanitary Engineering in Harvard University and the Massachusetts Institute of Technology, Member of the Massachusetts Public Health Council. Vol. II. Cambridge, Mass.: Harvard University Press. London: Humphrey Milford, Oxford University Press. Cloth; 6 x 9 in.; pp. 441; illustrated. $2.50.

In the second of his three volumes epitomizing the work of the Massachusetts State Board of Health, Professor Whipple devotes most of his space to 34 reprints and abstracts of papers and special reports scattered through the many volumes published by the board from 1869 to 1914. In addition, Professor Whipple presents many very brief abstracts of scientific articles and reports published during the period named.

The first of the reprints is an address on "State Medicine" delivered by Dr. Henry I. Bowditch at the first meeting of the board, Sept. 15, 1869. Following this a circular letter addressed by the board to "The Mayor and Board of Health of Every City, the Selectmen of Every Town, Every Member of the Legislature of 1869, and Every Clergyman and Physician in Massachusetts." It contains the following sound doctrine: "We believe that all citizens have an inherent right to the enjoyment of pure and uncontaminated air, and water, and soil; that this right should be regarded as belonging to the whole community; and that no one should be allowed to trespass upon it by his carelessness, or his avarice, or even by his ignorance."

Extracted from the 1878 report of the board is a paper entitled "The Filtration of Potable Water," written by Prof. Wm. Ripley Nichols. This is one of many classics on water and sewage treatment which are reprinted in full or abstract in this volume. Some of the other papers and authors are: "Suggestions As to the Selection of Sources of Water-Supply," by F. P. Stearns; "Typhoid Fever in Its Relation to Water-Supplies," H. F. Mills; "The Chemical Precipitation of Sewage," Allen Hazen; "Microscopical Analysis," Wm. T. Sedgwick; "Investigations Upon Nitrification and the Nitrifying Organism," E. O. Jordan and Mrs. E. H. Richards; "The Interpretation of Water Analyses," T. M. Drown; "Some Physical Properties of Sand and Gravel, with Special Reference to Their Use in Filtration," Allen Hazen; "Examination of Sewer Outlets in Boston Harbor," X. H. Goodnough; "Review of Twenty-One Years' Experiment Upon the Purification of Sewage at the Lawrence Experiment Station," H. W. Clark and Stephen De M. Gage.

Equally important writings and authors as well known in other lines of health board work could be given if space permitted. Enough have been cited, we trust, to bring again to the minds of our readers the many contributions made by the Massachusetts State Board of Health to public sanitation and the value of the work done by Professor Whipple in making readily available to all these classics in sanitary engineering and public health.

Intimate Studies of a Water-Supply

RIVERS AS SOURCES OF WATER SUPPLY: By Alex. Cruikshank Houston, M.B., D.Sc., F.R.S.Ed. Director of Water Examinations, Metropolitan Water Board. First three chapters reprinted from "The Journal of State Medicine," November and December, 1916, and January, 1917. London: John Bale, Sons & Danielsson, Ltd. Cloth; 7 x 10 in.; pp. 96; illustrated.

For many years Dr. Houston has been closely studying the character of the water-supply of London, England, as has been evidenced by his water-research laboratory reports and by his "Studies in Water-Supply." (The latter was reviewed by Geo. W. Fuller in this section, Apr. 15, 1914, p. 877.) The major part of his studies have related to the River Thames, which is the main water source of London. The present volume, which deals almost wholly with Thames water, originated in the Harben Lectures for 1916 before the Royal Institute of Public Health, which appeared in "The Journal of State Medicine" November and December, 1916, and

January, 1917. To the three lectures has been added a chapter on "Sterilization."

The author first exhibits the physical, chemical and bacterial quantities of Thames River water as affected by rainfall and by seasonal flow. He then presents a most interesting chapter summarizing the results of searches for stoeptococci, typhoid and Gärtner bacilli and the vitality of the cholera vibrio and the typhoid bacillus in Thames water. Most readers will be surprised to learn that Thames water evidently contains only one part of *fresh* excremental matter in 22,000,000 parts and that one might drink 15 liters or nearly 3.85 U. S. gal. of average Thames water without swallowing a single typhoid germ. The second chapter contains also an account of laboratory experiments to determine the "filtration resistance" of Thames water before and after storage. The apparatus is described, as also a special centrifuge for securing samples of the solids from the water and the method employed to obtain photomicrographs of the water content. A number of these views are reproduced. Finally, this chapter deals with changes in the quantity of Thames water due to storage—a subject in which Dr. Houston has long specialized. These general subjects are further considered in the third chapter, together with the treatment of algal infected water, the effect of filtration, and water and disease. The final chapter treats disinfection with excess lime, hypochlorite and liquid chlorine. Renewed attention may be called to that fact that hypochlorite disinfection was practiced under Dr. Houston on the water-supply of Lincoln, England, a city of about 50,000 population, from 1905 to 1911, thus anticipating the American practice by three years.

By way of minor criticism, it may be noted that the many useful diagrams in the book would have been improved by the use of abscissas and ordinates; that the typhoid statistics for American cities appear to be very much out of date (no dates given), and therefore unfair, and that the author's data on liquid chlorine also seem behind the times and meager. It should be remembered, however, that the original lectures were delivered more than a year ago and that it takes time for American data to become available in Englnad.

The book deserves the careful attention of all American engineers, chemists and bacteriologists having to do with surface water-supplies. Even the data which have little or no direct application in this country have large possibilities of suggestion and inspiration for all who approach their work in a scientific spirit.

Organic Structural Materials

WOOD AND OTHER ORGANIC STRUCTURAL MATERIALS: By Charles Henry Snow, C. E., Sc. D., Dean of the School of Applied Science, New York University, M. Am. Soc. C. E. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 478; illustrated. $5.

Wood as a structural material has had pretty thorough treatment in books written for the use of engineers; other organic materials commonly used in structures have not. The value of Professor Snow's book must then lie in the completeness or novelty in the treatment of the chapters on timber, and the engineering angle from which the discussions on oils, paints, varnishes, adhesives and rubber are viewed. In both of these respects the book may be said to be successful.

There is little new in the information on wood, but the arrangement of that information is admirable. Preliminary chapters on botanical classifications, physiology of trees, practical forestry, etc., are followed by specific pages describing the principal species of wood. These descriptions are in identical form, and include the nomenclature, localities, features of trees, color, grain or appearance of wood, structural qualities, representative uses, and physical properties of the woods. These tabulations are complete and informing. The information contained in them is most valuable to the engineer.

Succeeding chapters on wood take up specific physical properties and conditions affecting use and wear and are followed by a not altogether necessary chapter on fire protection. This ends the specific chapters on wood, though there is next a fairly complete exposition of wood-treating methods. The last part of the book, on the other organic structural materials, is novel and the engineering requirements of paints, oils, varnishes, glues and rubbers are adequately treated. As a whole the book is a definite and explicit reference and text.

Horizontal Tank Gaging Tables

HORIZONTAL CYLINDRICAL TANK GAUGING: Ratio or Percentage Method for Finding the Capacities of Cylinders at Any Level When in a Horizontal Position and for Finding the Areas of Circular Segments. Formulated especially for Horizontal Cylindrical Tanks with either flat or bulged heads such as are used for the transportation and storage of liquids. The Method Is Applicable to Cylinders of any Diameter.—By J. B. Morrow. Oakland, Calif.: S. O. Spencer [Lock Box 507]. Leather; 4 x 7 in.; pp. 68; illustrated. $10; foreign, $10.50.

Engineers in charge of road maintenance, repair and construction, and operators of asphalt plants and other industries purchasing liquids in tank-car lots, or persons who must compute the capacities of horizontal tanks, will find this book of more than incidental value in their day-to-day work. In a convenient form it presents rules, tables, and explanations by use of which anyone can compute and tabulate the contents of such tanks with a minimum of effort. As far as can be learned, this is the first comprehensive treatise on this problem.

The method of handling the problem is unique, and the accuracy obtained is well within the demands of such work. Only one basic table is needed for the computations, and from it can be determined the contents of a cylindrical tank of any diameter. Directions are also given by which the effect of bulged heads on capacity can be allowed for.

The method itself is based on the fact that the ratio between the area of a circular segment and the area of half a circle, of which the segment is a part, depends not upon the size of the circle but simply upon the ratio between the depth of the segment and the radius of the circle. While not of wide general interest, the problem of calculating the contents of horizontal cylinders is ordinarly so difficult of solution by usual methods that the book will no doubt find a place on the desks of many engineers.

Thirtieth Anniversary Number

The "Michigan Technic" (University of Michigan, Ann Arbor) featured its thirtieth anniversary in its December issue. Among other articles it contained one by J. H. Darling, a retired engineer of Duluth, Minn., on his private astronomical observatory, built

after his own designs, with the coöperation of an architect who is also an amateur astronomer. Another feature of "The Technic" was a spirited poem on "The Engineer," by Theodore A. Leisen—presumably Major Leisen, now in charge of utilities at Camp Custer.

Labor Unions Differ as to Functions

TRADE UNIONISM IN THE UNITED STATES—By Robert Franklin Hoxie, Ph.D., One Time Associate Professor of Political Economy, University of Chicago, Author of "Scientific Management and Labor," with an Introduction by E. H. Downey, Ph.D., Special Deputy of the Insurance Commission of Pennsylvania in Charge of Workmen's Compensation Insurance, late Chief Statistician of the Industrial Commission of Wisconsin. New York and London: D. Appleton & Co. Cloth; 5 x 8 in.; pp. 426. $2.50.

As the first student of trade unionism who perceived that, besides varying in type as to organization or structure, labor groups have functional differences through which a clearer understanding of the phenomenon might be secured, the late Prof. Hoxie occupies a unique position in his particular "guild." While the distinction he established may at first seem unessential, a close study of the application of the theory, as made in his posthumous volume, inevitably clears thinking and results in a saner attitude toward the problem.

The volume has been arranged from a series of lectures prepared for the classes in trade unionism at the University of Chicago. The students themselves made many researches under Prof. Hoxie's direction—for his method was thoroughly scientific and of the laboratory. As the basis of his own thinking and writing, he made himself familiar with conditions and tendencies not only through observing the manifestations of union activity, but by close study of the psychologic types of union organizers and of the actual conditions which lay behind their convictions. This intensity of research was unquestionably responsible for the discovery that unionism has its conservatives, its radicals, its nihilists, its altruists, and its materialists—that there is no entity such as "unionism" which can be covered by a phrase and dealt with as a single phenomenon—that the spectacle of working men uniting must be considered as many and diverse activities, the results of many and diverse causes.

And the causes? What of them? In general they cannot be traced back to the old guilds and crafts of the eighteenth century, but to conditions which were brought about by the introduction of machinery into a society organized in accordance with a highly individualistic philosophy.

Kutter's Formula Velocity Tables

TABLES OF VELOCITY OF WATER IN OPEN CHANNELS DERIVED FROM KUTTER'S FORMULA—By Arthur Alvord Stiles, State Reclamation Engineer. Bulletin 6, August, 1917. Austin, Tex.: State Reclamation Department. Paper; 6 x 9 in.; pp. 130. Free on application.

Velocities in feet per second to the nearest first and second place decimals are given for 30 different hydraulic slopes, for hydraulic radii from 0.2 to 50 ft., for n from 0.006 to 0.08. To aid in selecting from the 12 values of n suggestive notes are given. Eight of the 25 main tables were copied and extended from the "Hydraulic and Excavation Tables," issued by the U. S. Reclamation Service. The computations for the present tables were made by James P. Murray and John B. Upchurch, technical assistants to Mr. Stiles. The twenty-sixth table gives the velocity equations used in the computations, in order that those who so desire may verify the tabular velocities given or compute others, for values of n not given in the tables.

PUBLICATIONS RECEIVED

[So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be secured without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or in case of books or papers privately printed, then to the author or other person indicated in the noice.]

BUILDING STONES AND CLAYS: A Handbook for Architects and Engineers—By Charles H. Richardson, Ph.D., Professor of Mineralogy, Syracuse University, Syracuse. New York: The University Book Store. Cloth; 6 x 9 in.; pp. 422; 312 illustrations. $5.50.

BULLETIN OF THE SOCIETY FOR STREET CLEANING AND REFUSE DISPOSAL OF THE UNITED STATES AND CANADA. New York City: The Secretary, Jos. R. Buchanan, Municipal Building. Paper; 6 x 9 in.; pp. 22.

Issued in lieu of the Annual Convention, which, by vote of the Executive Committee of the Society, was abandoned because of the disturbed conditions due to the war.

DISASTERS AND THE AMERICAN RED CROSS IN DISASTER RELIEF—By J. Byron Deacon, General Secretary, Philadelphia Society for Organizing Charity (on Leave of Absence), Division Director of Civilian Relief for Pennsylvania. New York: Russell Sage Foundation. 5 x 8 in.; pp. 230. 75 cents.

FINAL REPORT OF THE INTERNATIONAL JOINT COMMISSION ON THE LAKE OF THE WOODS REFERENCE—Whitehead Kluttz, secretary for United States, Washington, D. C. Lawrence J. Burpee, secretary for Canada, Ottawa, Ont. Cloth; 7 x 10 in.; pp. 261; illustrated.

Physical facts and data on which are based the conclusions that the Lake of the Woods can and should be maintained at a relatively uniform level throughout all ordinary seasons and that the regulation should be under the control of the commission. The necessary regulation works and flowage damages would cost only a few hundred thousand dollars.

INTERCEPTING SEWER CONSTRUCTION IN THE NORTHERN PART OF THE SANITARY DISTRICT OF CHICAGO: Methods of Work and Cost Data—By H. R. Abbott, M. W. S. E., Assistant Engineer, Sanitary District of Chicago. Reprint from Journal of the Western Society of Engineers, June, 1917. Paper; 6 x 9 in.; pp. 33; illustrated. Free on application to Blaw-Knox Co., Pittsburgh, Penn.

A detailed description of 18 miles of sewer construction.

AN INTRODUCTION TO THE STUDY OF LANDSCAPE DESIGN—Henry Vincent Hubbard, Assistant Professor of Landscape Architecture, Harvard University. Theodora Kimball, Librarian, School of Landscape Architecture, Harvard University. New York: The Macmillan Co. Cloth; 9 x 12 in.; pp. 406; illustrated. $6.

IRON AND STEEL: Census of Manufactures, 1914: Including the Blast-Furnace, Steel-Works and Rolling-Mill, Wire, and Tinplate and Terneplate Industries—Prepared under the supervision of W. M. Steuart, Chief Statistician for Manufactures. Washington, D. C.: Bureau of the Census. Paper; 9 x 12 in.; pp. 68.

METER RATES FOR WATER-WORKS—By Allen Hazen, S. D., M. Am. Soc. C. E. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 217; illustrated. $2.25.

THE NATURAL STYLE IN LANDSCAPE GARDENING—By Frank A. Waugh. Boston: Richard G. Badger. Toronto: The Copp Clark Co., Ltd. Cloth; 6 x 9 in.; pp. 145; illustrated. $2.50 net.

OUTDOOR THEATERS: The Design, Construction and Use of Open-Air Auditoriums—By Frank A. Waugh. Boston: Richard G. Badger. Toronto: The Copp Clark Co., Ltd. Cloth; 6 x 9 in.; pp. 145; illustrated. $2.50 net.

SNOW REMOVAL IN THE CITY OF ROCHESTER, N. Y.—Report to Mayor by Rochester Bureau of Municipal Research, Inc. Paper; 6 x 9 in.; pp. 44.

THE STRENGTH OF STRUCTURAL ELEMENTS: A Textbook for Students, Engineers and Architects—By Ernest H. Sprague, A. M. Inst. C. E. With Examples. London: Scott, Greenwood & Son. [New York: D. Van Nostrand Co.] Cloth; 4 x 7 in.; pp. 196; 117 illustrations. 4 shillings net. American price, $1.75 net.

A pocket-size book suitable for elementary instruction of engineering students. Riveted joints, roof-trusses, beams, plate-girders and columns are covered in the main part of the book, followed by chapters on the three-movement theorem and oblique flexure. The treatment follows foreign practice. Theory being considered to the exclusion of experimental knowledge, the section on columns does little more than tell how to use formulas of the Rankine and straight-line types in design.

UNION SCALE OF WAGES AND HOURS OF LABOR, MAY 15, 1916—Washington, D. C.: Bureau of Labor Statistics. Paper; 6 x 9 in.; pp. 291.

UNITED STATES GEOLOGICAL SURVEY: Annual Report 1916-1917—Washington, D. C.: The Survey. Paper; 6 x 9 in.; pp. 176; folding maps.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Should Engineering Students Be Drafted?

Sir—I have read, in your issue of Dec. 27, 1917, p. 1211, the letter of the fighting MacIsaac. Fortunately the committees of the great engineering societies and one of the faculties of the great engineering schools, who have been considered in this matter, agree that the best interests of the country will be conserved if we are allowed to continue to produce an article valuable in the proper conduct of the war both from a military and a civil point of view. Any one receiving as many letters as I from the various government war departments, as well as from civil organizations, asking for young engineers who cannot possibly be supplied, would certainly appreciate their value and understand what the stoppage of production would mean in coming years.

I would have less confidence in the result of our efforts in the war if, as Mr. MacIsaac says, those students who have not volunteered "would be useless if drafted," since this would equally apply to all others who are to be drafted to form our great army.

PALMER C. RICKETTS,
President, Rensselaer Polytechnic Institute.
Troy, N. Y.

Rapid Topographic Surveys

Sir—I have read with interest the various items appearing in *Engineering News-Record* with reference to topographic surveying and mapping that has been accomplished with a small outlay. The following will possibly be of interest to the "speed fiends." In 1916 this office made a topographic survey of this city and surrounding territory, embracing in all an area of 6200 acres. Careful control, adjusted by stellar observations, and adjusted level circuits were carried over the entire area, and the topographic features were mapped in the field with plane table. The contour interval of the field sheets was one foot. Each field sheet as completed was traced with 5-ft. contours, and a number of individual elevations were shown.

The entire work, including field and office work, key map, etc., cost the sum of $578.60, or an average cost of 9.3c. per acre.

The work was performed by the writer, assisted by W. F. Hicks, assistant topographer, U. S. Geological Survey, and two laborers.

A. D. DUCK,
Greenville, Texas. City Engineer.

Remedy for Alleged Confusion Due to Use of the Term "Mass"

Sir—Textbooks, tables and government documents tell us that it is more precise to speak of the "mass" of a pound than of the "weight" of a pound. Hence pounds, grams, kilograms, are well-recognized units of mass; in fact, in some textbooks they are given as the *only* units of mass used in engineering practice. Yet when we use formulas such as $\frac{1}{2}mv^2$ for the energy in a moving body we are told that, notwithstanding the fact that pounds, grams and kilograms are true units of mass, and that a pound of mass weighs a pound, etc., we cannot substitute for the m its value in those units, but must instead insert w/g, the weight (therefore also the mass in those units) divided by gravity. This naturally confuses the student or the engineer who likes to understand what he is doing and why, especially as he was given to understand that a pound of mass weighs a pound, from which he naturally understands that (barring the variation of gravity) the number of pounds of mass equals the number of pounds of weight.

To add still further to the confusion we are informed in well-known textbooks that this quantity w/g "has no unit," that it is not a physical quantity at all but merely a "ratio" or numeral (which is incorrect), hence not a mass at all, even though the formula calls for the mass. Also that "the number of units of mass in a body $= w/g =$ constant," yet this "constant" is different in each problem. Also that when 2 lb., therefore a mass of 2 lb., drops 3 ft. it represents 6 ft.-lb. of energy, in which very common case the number of pounds must *not* be divided by g to give the correct result.

In attempting to clear up this confusion it has been proposed to create a lot of new units, such as slug, geepound, engineer's unit of mass, metric slug, gryne, matt, metrog, etc., making the confusion still worse, with the result that the student and the careful engineer hesitate to use that useful quantity "mass" in their calculations.

All this confusion and all these confusing new units are quite unnecessary and could be entirely avoided if textbook writers would always state not only what units the letters in a formula stand for, but also in what units the resulting answer will be. In the common formula $\frac{1}{2}mv^2$ it is quite proper to substitute the mass in pounds as one naturally would do, and the answer will be quite correct, but the answer will necessarily be in terms of the less familiar though well-established unit "foot-poundals," which may then be readily reduced to the more usual unit "foot-pounds" by dividing by $g = 32.172$. Hence by simply shifting the division by g from one side to the other, confusion is cleared up, because the regular mass units, pounds, grams and kilograms, can then be used, and every student understands that if his final result is not in terms of the units he wants, he has to multiply or divide it by a conversion factor, which in this case is g. All these many proposed and confusing units of mass and pages of explanations (including some quite incorrect statements) are therefore entirely unnecessary, and the student need not hesitate to use the ordinary, well-known units of mass, pounds, grams and kilograms, for the m in these formulas.

The original cause of the confusion is that these units are sometimes (and quite properly) used to represent masses and sometimes forces. In the well-known unit of energy, foot-pounds, the pounds represent pounds of force, the derivational formula being force $\times$ distance $=$ energy. But in the formulas like $\frac{1}{2}mv^2$ the pounds represent pounds of mass, the derivational formula being mass $\times$ velocity^2 $=$ energy, and, as the force which acting on a pound of mass for one second and giving it a velocity of one foot per second is a *poundal*

(which is a pound of force divided by g), the energy must necessarily be in foot-poundals.

In its simplest form (though then lacking the derivational features) this useful formula can best be stated:

$mv^2 \times 0.0005099 =$ gram-centimeters, when m is in grams (of weight or mass) and v is in centimeters per second.

$mv^2 \times 0.01554 =$ foot-pounds, when m is in pounds (of weight or mass) and v is in feet per second.

$mv^2 \times 0.05099 =$ kilogram-meters, when m is in kilograms (of weight or mass) and v is in meters per second.

These of course are based on the standard value for gravity; in the very rare cases in which the variation of gravity must be considered, the less simple formulas must be used.

It may be added here than when the masses are expressed in kilograms and the velocities in meters per second, in this formula $\frac{1}{2}mv^2$, the numerical results will be the energy in joules, volt-coulombs, or watt-seconds, which is an interesting illustration of the simple unity-relation which exists between the mechanical metric and these so-called electric units (which are in fact mechanical also).

CARL HERING.

Philadelphia.

Coördination of Engineering Work in New York City

Sir—Referring to the timely editorial on "Uncoördinated State Engineering Sets a Problem," in your issue of Dec. 27, let me give a couple of incidents where coördination has been very effective.

Consolidation of the city of New York in 1898 brought in a heterogeneous lot of engineers, but with few exceptions little real combining followed. In 1902, however, the President of Richmond Borough gave to the Commissioner of Public Works practically a free hand for rearrangement. One central engineering bureau was established covering work of investigation, design, construction, and some maintenance, for sewers, highways, public buildings, topographical survey, retaining walls, bridges, refuse-disposal plants, street cleaning, street-railroad supervision, grade-crossing elimination, subsurface structure mapping, etc. A centralized filing bureau was established for all maps, plans and data. Two main divisions were organized, entitled "topographic" and "construction." Specialists were put in charge of each phase of work, but were assignable as needed to other work than their own, upon request from any bureau head, for special service. All the work came under the final "say" of the Engineer-Commissioner.

The method turned out well as concerns the work of the corps of about 250 engineers, and tended also to be helpful to the men themselves, at least the brighter ones, in giving them a varied range of experience rather than holding them to a single line of work for all time.

In 1910 there were organized two informal boards covering the city as a whole. One, composed of the chief engineer of the Board of Estimate and Apportionment and the consulting engineer of each of the five boroughs, met on the afternoons following Board of Estimate meetings, and discussed countless matters pertaining to engineering work of importance to the whole city: unifying specifications, plans, ordinances, forms of procedure, etc., and investigating many matters referred by the Board of Estimate. If something was to come up involving bridges, the chief engineer of that department was invited in, and so with other departments, as water, docks, etc. This consulting body had no final authority, but its suggestions carried weight and produced some very valuable results.

The second board, called the New York Sewer Plan Commission, had the same personnel as the first, but dealt specifically with sewer questions. It worked more directly through the borough president's sewer bureaus, and its function was to look to scientific testing, standards of design and harbor purification.

Only three states exceed New York City's population, and none have more intensive development, so that the methods carried out thus successfully here might well work out to advantage elsewhere. Coördinated direction and centralized final authority, with decentralized work carrying definite responsibility, is the key to public works success.

LOUIS L. TRIBUS.

New York.

The Engineer's Interest in Foreign Trade

Sir—In your issue of Oct. 25, 1917, there appeared an editorial entitled "The Engineer's Interest in Foreign Trade." There were two very serious errors in regard to that editorial. In the first place the editorial should have been printed throughout in the same type used in the heading, and in the second place you should have placed the article on the front cover of your journal. Otherwise you are to be congratulated.

Perhaps, in view of the fact that we are at war and have a serious work on hand, your readers may think that the writer is laying needless stress on our foreign trade interests at this moment. Therefore he wishes to say that in making the foregoing remarks he is fully cognizant that we are at war. We must and will win the war, but because we are going to be the deciding factor in this struggle, the end will find the position of the United States one of prominence in the world; and if we cannot, when peace is declared, live up to the reputation we are gaining now, much of our efforts and energy will have been wasted. Heretofore American capital has been content to play the part of the cat, chasing its tail within the territory of the United States, and, because we never really did anything abroad, our reputation for ability to develop and finance world affairs was not what many Americans supposed it was. The time has come now when both our Government and our people must widen their horizon of vision and it is to be hoped that you will follow up your editorial with more of like trend.

As the writer has said before in your columns, the American public is entirely too apathetic toward the amount of development which must be carried out in various parts of the world, and the people of Europe are much more wide awake in this respect.

American engineers who have practiced their professions abroad should lend their help toward informing the public of the true state of affairs, because engineers are preëminently in a position to speak with

authority on conditions existing in countries where there is an opportunity and need for development. In comparison with other classes of people they are in a very advantageous position to gather facts, because their work brings them into close contact with actual conditions for extended periods, which advantage is hardly enjoyed by the mere tourist or business man.

Even Government employees do not get as close to things as may be supposed. As an example, the writer has before him a clipping from an American official report concerning a certain contract for a public utility, with the request that he investigate this matter. It happens that the contracts were closed and the work initiated over fifteen months ago.

The last paragraph of your editorial is especially worthy of note; it is in these points that we are as a whole very much lacking.

The importance of the use of the metric system in engineering work abroad cannot be overestimated, and yet only a few months ago the writer was astounded to note in an American magazine of high standing an article entitled, "The Metric System Myth." The magazine purported to have extracted the article from the *American Machinist*, and stated that the editor of the latter journal had declared that the metric system was not in general use in France.

Perhaps the authority given for the article was wrong, but the metric system is in use in France, very much so, and also in practically every other country in the world except the British Empire and the United States, and even Great Britain is now using the metric system in foreign trade. Even British and American standards are in many cases identical in name only.

If the American manufacturer or contractor wishes to go abroad, the sooner he adopts the metric system the better, and there are no unsurmountable obstacles in the way. Certainly it is as easy to state weights in kilograms, volumes in liters or cubic meters, and measurements in meters, centimeters and millimeters as it is to state them in the English system; and when we talk in the metric system we are talking in a fairly universal language. It is well understood that dimensions of parts of existing standards of fine machinery can sometimes not be stated conveniently in millimeters, but the measurements of such parts are hardly of importance except to the manufacturers, and in the shops they are usually gaged and not measured. But when we talk of the dimensions of bridges, buildings, railways, land, semi-finished material and the commodities of trade and engineering in general in units that no one but ourselves use, we are hurting ourselves.

Sometimes American manufacturers do prepare catalogs in the metric system, but when they have to state, say, wire diameters or sheet-metal thicknesses, they still use arbitrary gages, and sometimes do not even state what gage they are using. As there are about seventeen systems in use, how is a foreigner not trained in American shops and offices to know what is meant? Millimeters are universal. If any one doubts the utility of the metric system let him give it a fair trial in his calculations for a few days. At first a little difficulty will be experienced in forming mental conceptions of the quantities, but engineers and constructors work by scientific calculations, and not by rule of thumb. All units in electrical engineering are based on the c. g. s. system, and there is no reason why mechanical and civil engineers cannot speak and calculate in the same terms.

Even that monetary monstrosity—the English system of coinage—could easily be transformed into a decimal system by calling a half sovereign the unit, whereby we would get ten shillings to the unit. Ten pence could be equal to one shilling, and the only change in coinage would be marking a sixpence as five pence. For a short period sellers would probably be given slightly greater values for sales under a shilling, but this might be of some advantage to the people who need it most.

When it comes to figuring foreign exchange, no matter what system of coinage a particular country has, all sorts of erratic ratios will occur between the standard units of different countries, and such ratios will be constantly varying—a point that Americans must grasp. Persons not accustomed to the phenomena of international exchange are surprised when told that a dollar has not a fixed value in terms of the money of other countries, but this is quite true, and a realization of this fact is very necessary to an engineer interested in foreign work, especially if he has to deal in matters regarding finance.

Suppose, for example, he is operating a public-service concern in a South American country where his receipts and local disbursements are in the units of the country where he is operating. If he works out his reports in the units of another country he is likely to get all manner of surprising results and comparisons for consecutive financial periods. Therefore he has to know the meaning of exchange and be able to take into account its effects on his operations.

There are all sorts of other matters of importance that an engineer must grasp if working abroad, and your editorial broadly indicated this when it spoke of the "systematic education of a good portion of the rising business generation in the numerous new subjects which must be mastered for the successful development of foreign trade," and the main reason the writer has for presenting the foregoing is to keep this subject alive and provoke intelligent questions and communications.

By all means let us have as much light as possible on this important phase of our national development.

Rio de Janeiro, Brazil. CHARLES J. SEIBERT.

[The clash in statements by Mr. Seibert and the *American Machinist* is more apparent than real. The journal in question stated that the metric system is not in general use in France, while Mr. Seibert says it is much in use. Both seem to be correct. The attitude of the *American Machinist*, its editor states, is that while there is no objection whatever to volunteer adoption by manufacturers of the metric system, the advantages of the system are not great enough to warrant the expense and confusion that its compulsory adoption would cause.—Editor.]

Inch-Foot Water Charge Proposed

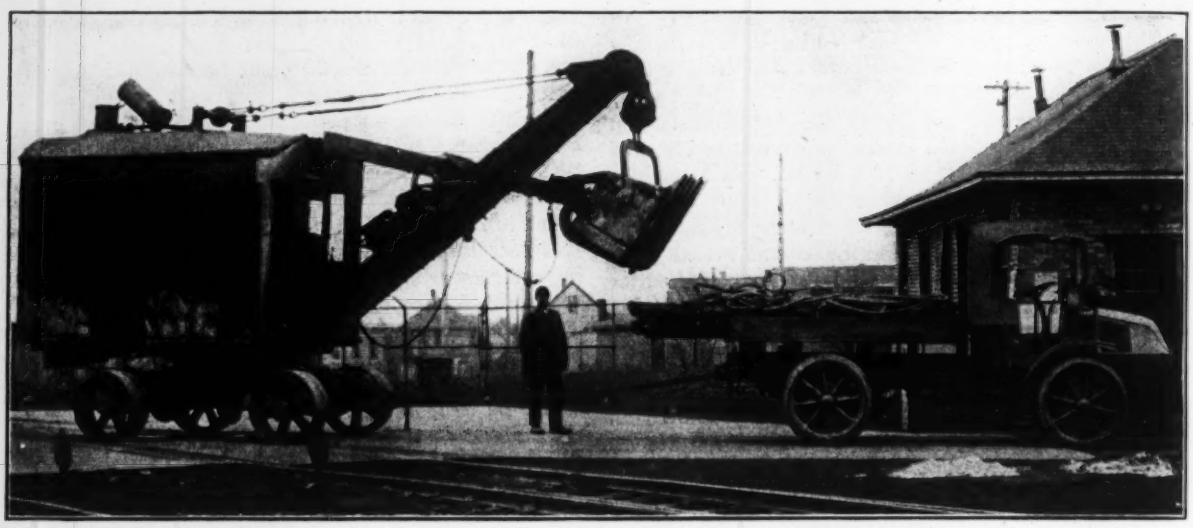
An annual charge of 0.6c. per inch diameter for each foot of water mains is proposed in a schedule of rates submitted by the Commonwealth Water Co. to the New Jersey Public Utilities Commission for approval. The company supplies water in Summit, West Orange and five other communities.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Milwaukee Contractor Hauls Shovel About Town at 8 Miles an Hour

ARTHUR MANGER, excavating contractor of Milwaukee, does not believe in wasting the time required for his revolving shovels to navigate the city streets from job to job unaided. At least, the ⅜-yd. shovel shown in the photograph, which weighs about 18 tons, did not travel in that way. The shovel is shown in tow of a Walter tractor on a 5-mile trip which it recently made at the rate of eight miles an hour. On this journey it was hauled up a 3½% grade without difficulty.



MOTOR TRUCK HAULS 18-TON REVOLVING SHOVEL THROUGH CITY STREETS FOR FIVE MILES AT GOOD SPEED

Men and Hoist Pull Off Concrete Pile Tops After Reinforcing Is Cut

SOME precast concrete piles in one of the navy yards were driven to refusal while their tops were still above proper grade. The method of cutting them off is described by Civil Engineer Kirby Smith, of the United States Navy, in Bulletin 28 of the Public Works of the Navy. The piles were 18 in. square at cutoff, reinforced with eight ¾-in. square rods tied together with ⅜-in. wire hoops 2 in. c. to c. for a distance of 3 ft. from each end and 8 in. c. to c. between these limits. They were driven 3 to 20 ft. above the required elevation, the difference being due to a varying stratum of rock. Outside the reinforcing rods there was a protective concrete covering of 2 to 2½ in. This was chipped off at the required level with a cold chisel and a sledge, leaving the rods exposed. An air drill was tried, but the chisel-and-sledge method was found to be easier. Then the rods were cut with an acetylene torch. This left the concrete core, which had a low tensile strength. Where the projecting pile was of sufficient length to give good leverage, a 1½-in. manila rope was slung around the top and four men pulling on the rope snapped the pile off at the cut. Where the projecting portion was short, the same result was accomplished by a direct pull from a stationary engine and a ⅞-in. steel cable attached to the top of the pile. Two men were employed in cutting out the concrete, and four men to snap off the piles. The average time for each pile was one hour, and the total cost per pile averaged 60 cents.

Mixture of Asbestos and Cylinder Oil Useful in Babbitting

BY LOUIS A. M. BUSHNELL
Oak Ridge, N. J.

THE writer has found that where there is much babbitting to do fire clay can be replaced conveniently by a mixture of asbestos and cylinder oil. The asbestos and oil should be mixed to a plastic state, and can be used a good many times.

Wreck Brick Building in One Day with Dynamite and Save the Brick

BY HARRY GOUGH
St. Mary's County, Maryland

Twelve dollars, in addition to labor, covered the entire cost of wrecking a three-story 30 x 40-ft. brick building, the interior of which had been destroyed by fire. Two men did the entire job in one day. The walls were 2 ft. thick except at the corners, where they joined two brick chimneys. There the thickness increased to 5 feet.

It was desired to salvage the brick, yet scarcity of labor made wrecking by hand prohibitive. The writer

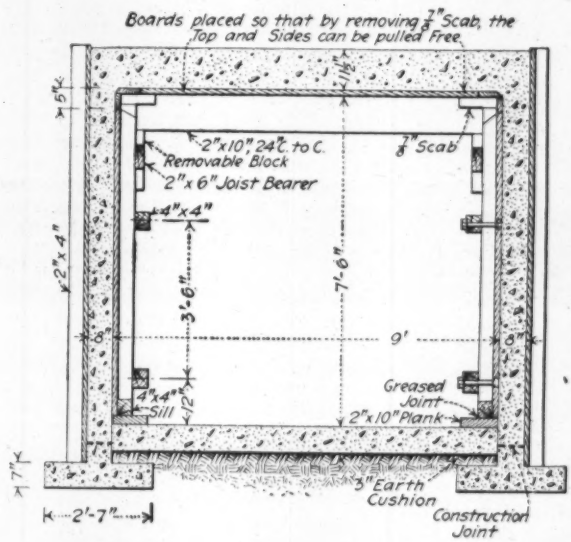
had holes 6 to 8 in. in diameter picked half way through the base of the walls at intervals of 6 ft. They were then loaded with three sticks 1½ lb. of 30% dynamite in each hole along the walls, and five sticks at the chimneys. One wall was shot at a time, using a battery. Most of the bricks, except those close to the blast holes, were unbroken and fit for further use after they had been cleaned.

It took 55 lb. of dynamite and 35 caps to clean up the entire job.

Place Floor of Tunnel First, Use Sliding Form for Walls and Roof

By Frank A. Baxter
Concrete Construction Co., Cincinnati, Ohio

SLIDING forms were found to effect a great saving in time and labor in the recent construction of a concrete tunnel for the Eastman Kodak Co. The tunnel, connecting the power house and a new building, is 810



FOOTINGS AND FLOOR PLACED FIRST, PARTLY COLLAPSED FORMS SLID ON GREASED JOINTS

ft. long and will be used to carry steam pipes and electric conduits.

The specifications called for a footing 31 in. wide under each wall, a 7-in. floor slab and a 3-in. earth cushion between the floor slab and the top of the footings. In order to get a firm base on which to slide the forms, and also to avoid mud and water, it was desirable to pour the floor slabs before the side walls. The footings and 5 in. of the walls were therefore concreted first. The 3-in. cushion was then placed and the floor slab poured. The sliding forms, shown in the drawing, were then set in place, the walls and roof slab being poured together.

The inside forms were built in three 16-ft. sections and were set on a 2 x 10-in. dressed plank runner well greased on top. On this plank the side panels bore directly. They were made up above ground, and consisted of a dressed 4 x 4-in. sill, 2 x 4-in. battens on 2-ft. centers, and ⅞-in. sheathing.

The roof slab was supported on 2 x 10-in. joists on 2-ft. centers, which rested on continuous 2 x 6-in. joist-bearers nailed to the side forms. Between each joist and the 2 x 6-in. bearer a 4-in. block was placed which could easily be knocked out, permitting the roof panels to drop 4 in. The joist and roof panels were made 8 in. shorter than the width of the tunnel, which permitted the side forms to be drawn in 4 in. on each side, and gave clearance enough for the forms to be slid along to their next position. The top corners were filled in with loose boards held in place by ¾-in. scabs as shown on the drawing. These boards remained sticking to the concrete when the sides and roof were collapsed.

The wall forms could be pulled in by means of two 4 x 4-in. rangers bolted to each side. It was planned to use carpenter's bench clamps to draw in the sides, but these were not strong enough. A rope loop slipped around the 4 x 4's and twisted with a bar was very effective. The collapsed forms were moved forward by six men with a double tackle. Three 16-ft. sections, making 48 lin.ft. of tunnel, were placed and concreted at a time. The three sections could be collapsed, moved forward and reërected within two days by six carpenters.

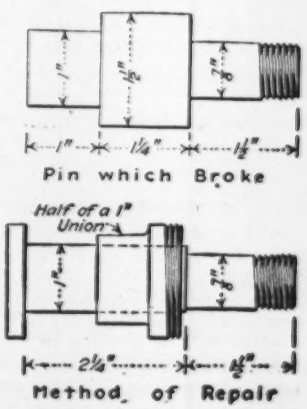
The exterior wall forms were built and placed with panels 20 in. wide, tacked to 2 x 4-in. battens 2 ft. apart, and wired every 20 in. The tunnel was designed by the Eastman Kodak Co. and built by the Ferro-Concrete Construction Co. The forms were designed and built by Stacey Campbell, superintendent of the work, O. E. Brown, carpenter foreman and the writer, form designer for the contractors.

Repair Pin of Steam Shovel Engine with Half of Pipe Union

By Louis A. M. Bushnell
Oak Ridge, N. J.

THE pin which holds the link motion of the valve stem blade on a Marion Model 31 steam shovel, engaged on dam construction for the City of Newark, near Oak Ridge, N. J., was recently replaced, after it had broken, with a pin made of a 1-in. bolt and half of a pipe union.

When the part broke, there was no spare pin to replace it on the job, and no machine shop was near. Ten days would have to elapse before a new pin could come from Ohio, and it was very important to keep the steam shovel running. The writer took a 1-in. bolt and drew the end down to ⅞ in. diameter, putting a thread on the small end. Half of a brass union was then filed to fit on, as shown in the sketch.



ONE-INCH BOLT AND PIPE FITTING MAKE NEW PIN

The steam shovel was running within an hour after the original pin broke, and the substitute pin gave good service for three weeks.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Government To Build Barges for Mississippi

Shipping Board Has Allotted Three Millions To Be Spent by Chief of Engineers

After some months of indecision the United States Shipping Board has finally allotted $3,360,000 for the construction of four towboats and 24 barges to be used in freight carriage on the Mississippi River. The operating program of the fleet has not been announced, but the board has turned the work of construction over to the chief of engineers of the army. It is proposed to ask bids for building the vessels in the customary manner. Plans and specifications are being made in the St. Louis office of the Engineer Department.

While full details of the boats cannot now be given, it can be said that the barges are about 300 ft. long and 48 ft. wide, and that they will carry 750 tons on a 4-ft. draft, and correspondingly greater amounts as greater depth of channel becomes available. Thus on a 6-ft. draft the barges will carry about 1800 tons and on 8 ft. about 2600 tons each. It is expected that each towing unit will consist of a towboat and three barges. The towboats will be of unusual power for the upper Mississippi, developing 1500 hp. on 3½-ft. draft and 2000 hp. on 4-ft. draft, the difference in draft being controlled by the amount of coal carried. These boats will be of stern-wheel type and will incorporate all of the most approved details in boilers and machinery.

Date of Foreign Trade Convention Is Changed

The Executive Committee of the National Foreign Trade Council announces that "owing to the railroad congestion and the desire of the Council to coöperate with the Government in the relief of the situation due to the war," the dates of the Fifth National Foreign Trade Convention to be held at Cincinnati, Ohio, have been changed from Feb. 7-9 to Apr. 18-20.

No change in plan and scope is contemplated. The three days of the convention will be devoted to the obligation laid upon the foreign trade enterprise of the United States to help in winning the war, as well as to discussion of the war-winning value of foreign trade in sustaining credit through the maintenance of the gold reserve, and in insuring supplies of necessary raw materials for war use. Consideration will also be given to the demands and problems of the renewed competition after the war.

A. N. Talbot Elected President of American Society

Prof. Arthur N. Talbot, of the University of Illinois, has been elected president of the American Society of Civil Engineers for the coming year.

Professor Talbot was born in Illinois Oct. 21, 1857. He was graduated from the civil engineering course of the University of Illinois in 1881. From 1881 to 1885 he was engaged in various railroad work in the West. In the latter years he returned to his alma mater to become a member of its faculty. In 1890 he was made professor of municipal and sanitary engineering and given charge of theoretical and applied mechanics, and he has held these posts ever since. Although he has thus remained 27 years in one place, his activities, both in the development of engineering education at the University of Illinois and in his outside work, have made him a prominent feature in engineering investigations.

ARTHUR NEWELL TALBOT

Under Professor Talbot's direction the University of Illinois developed systematic laboratory work in strength of materials as early as 1890, his efforts culminating in one of the best-equipped material-tesing laboratories in the country. Under his direction, too, have been made important studies of the properties of built-up iron and steel members, brick and terra cotta columns, timber, paving brick and reinforced concrete.

The hydraulic laboratory of the University of Illinois, also one of the best equipped of its kind in the country, is likewise in part his work. He has made a wide range of hydraulic investigations.

He has contributed much to the study of railroad problems. His book on "The Railway Transition Spiral" is one of the classics on that subject. The studies now being made by the joint committee of the American Society of Civil Engineers and the American Railway Engineering Association, of which he is chairman, bid fair to produce the first authoritative information ever obtained on the stresses in railway track.

In view of the wide range of investigations that Professor Talbot has followed, it is not strange that he has held a prominent place in technical societies. He became a member of the American Society of Civil Engineers in 1898, was a director in 1909-10 and vice president in 1911. He was president of the American Society for Testing Materials in 1913-14, having previously been vice president. He is at present a director of the American Railway Engineering Association. He has been president of the Society for the Promotion of Engineering Education, vice president of the National Association of Cement Users and executive secretary and then president of the Illinois Society of Engineers. In addition, he is a member of the Western Society of Engineers, the American Water-Works Association and the American Society of Municipal Improvements. He was vice chairman of the Committee on Reinforced Concrete of the International Association for Testing Materials, and was a representative of the American Society of Civil Engineers of the Joint Committeee on Concrete and Reinforced Concrete.

Opinions Conflict on Pending Water-Power Legislation

The House of Representatives on Jan. 11 adopted a resolution creating a special committee of 18 which is to handle all water-power legislation during the present Congress except bills over which the Committee on Foreign Affairs has jurisdiction.

To this latter committee has been referred a bill introduced on Jan. 9, empowering the President to take over all the water-power plants on the American side at Niagara Falls. The owners of the plants are to receive a "just and fair compensation for the use of their property," to be fixed by an impartial agency to be named by the President upon the basis of a reasonable profit in time of peace. The President is also authorized to import from Canada the maximum horsepower per-

mitted under existing treaties and to open negotiations for a new treaty providing for increased diversion of water on the American side, "having due regard for the preservation of the scenic grandeur of Niagara Falls and of the rapids." The bill appropriates $20,000,000 as a revolving fund to pay for installations to increase the power and to meet any deficits that may be incurred in the operation of the plants.

While some opposition has been voiced in the House to the administration bill providing for the grant of licenses by the Government for the development of water-power projects, the prospects for its passage there after some amendment appear favorable.

In the Senate the prospect is uncertain. The Shields bill, which has already passed the Senate, is itself a compromise measure, and while it is understood that the Administration will endeavor to bring the Senate to the support of its measure, the harmonizing of conflicting opinions may prove impossible.

Highway Board Submits Plan for Terminal Relief

The Highways Transport Committee of the Council of National Defense presented to the Highway Traffic Association of New York its plan for the relief of the terminal congestion which is at present such a tremendous problem in Manhattan. The scheme as explained by Roy D. Chapin, chairman of the committee, at a meeting held at the Automobile Club, New York City, Jan. 15, involves a practical pooling of the trucking resources of the city in order to effect what is known as "store-door deliveries," through which individual consignees will surrender their privilege of having freight held in cars.

As outlined by Mr. Chapin, the regulations, if adopted, will result in the unloading of cars as soon as possible after their receipt at Manhattan piers or freight stations. This unloading will be done by railroad employees who will pile the freight according to delivery zones. While a merchant may use his own trucks to carry freight to the piers or stations, he may not place in them goods intended for more than one station. As soon as the truck is unloaded it virtually passes from the control of its owner, and cannot leave the pier or station until it is fully loaded with freight. This loading will be so arranged that trucks will make deliveries in only one zone, but perhaps to several merchants.

The committee announced that their plan was submitted in the hope of drawing the widest possible criticism. As it now stands it is proposed only as a remedy to be applied to the Borough of Manhattan, New York City. However, the committee pointed out that "store-door delivery" was at present the only plan under which freight could be shipped in Great Britain, and that its operation has demonstrated that its simplicity and expedition had more than outweighed the objections.

"Sense" of American Society Meeting Opposed to Revised Constitution

Discussion Headed Off by Resolution Calling for Letter Ballot—Final Reports of Two Committees Accepted

What was expected by some to be a spirited discussion of the proposed revised constitution of the American Society of Civil Engineers was forestalled yesterday, Jan. 16, at the 65th annual meeting of the society by a resolution referring the matter to the membership for letter ballot. Nelson P. Lewis, who opposed the changes, introduced the resolution; and embodied in it was a declaration that the "sense of the meeting" was opposed to the adoption of the revision. The resolution was passed without discussion. Thanks to the quick disposal of this matter, and the absence of new business, the meeting was adjourned in two hours and 15 minutes, despite the necessary injection into the proceedings of the president's address, and the half-hour consumed in the reading of the printed reports of the board of direction, secretary and treasurer. Two final reports, those of the committees on road materials and on steel columns and struts, were accepted with little discussion. Progress reports were received from the four other special committees.

Although 803 members were registered as having indicated their intention to be at the meeting, the actual attendance was considerably less than that of last year. A war service flag displayed showed 953 members of the society in service, but it was stated that the number is now nearly 1000.

The first business of the meeting was the address by the incoming president, George H. Pegram, extracts from which appear on page 116. As stated there, this address was delivered at this time because of the abandonment of the annual convention last June.

Report of Board of Direction

The annual report of the board of direction showed a net gain in membership of 398, as compared with 283 for the previous year. The total membership Jan. 1, 1918, was 8590.

During the year additional payments aggregating $208,500 have been made to the United Engineering Society, bringing the total cost of the share of this society on this account up to $262,500. To secure this money a mortgage debt of $150,000 has been incurred, the balance, $112,500, having been paid out of reserve and current funds.

War activities of the society mentioned in the report include the joint telegram signed by President Pegram and the presidents of the other founder societies Feb. 6, expressing to President Wilson the cordial unity in support of the administration of the combined membership of 30,000 engineers; the adoption Mar. 7 of resolutions commending the severing of diplomatic relations with Germany, and offering to the Government all of the service of which the members were severally and collectively capable; the adoption by the board Apr. 18 of resolutions urging Congress to pass a bill for universal military training; the aid extended by the membership in the recruiting of engineer regiments; and the offer of the old society house to the food administration. Among the other of the many activities of the year recounted in the report are, besides the moving of the society to its new quarters in the Engineering Societies Building and the formal welcome of Dec. 7, the formation of the Engineering Council and the appointment of Alfred D. Flinn, director of the American Society of Civil Engineers, as executive secretary of the United Engineering Society the Engineering Foundation and the Engineering Council.

Engineering Education

Desmond Fitzgerald, chairman of the special committee on engineering education, announced that while the committee could still report progress only, a full report, based on the findings of the Carnegie Foundation, would probably be issued this year. At his request Dr. C. R. Mann reviewed briefly what had been previously reported by the foundation and what lines the investigation had followed since the last report. He mentioned three elements in the average engineering problem—science, practice and cost. He held that most of the schools dealt with the first well, the second fairly so, but the third hardly at all—and yet the control of engineering work is largely in the hands of those who are concerned primarily with the cost. The forthcoming report will indicate how engineering education should be shaped to recognize the importance of this third element.

A 247-page progress report of the special committee on stresses in railroad track was presented by Prof. A. N. Talbot, chairman of the committee and incoming president of the society. Still further progress, stated Professor Talbot, has been made since Nov. 3, when the report was printed.

Brief progress reports of the soil and water-rights committees were presented.

Two Final Reports Accepted

A final report of the committee on materials for road construction was presented by George W. Tillson, in the absence of Lieut. Col. W. W. Crosby. Mr. Tillson pointed out that, while the report embodied many of the suggestions made at the various discussions of the progress reports, it could not accept them all, and was perhaps not even entirely in accord with the views of the individual members of the committee. He also contended that with road work in such an experimental

state, the report would necessarily soon be out of date. He asked, however, that it be accepted as final, and that the committee be discharged. It was so voted, the thanks of the society being tendered to the committee.

L. D. Rights, chairman of the special committee on steel columns and struts, presented a final report for that committee. Part of this, he pointed out, was a repetition of the matter previously brought forth in progress reports. Among the special features of the report, he called attention to a new term, the useful-limit point, adopted by the committee. He also stated that the committee had concluded that it would be useless to attempt to write a rational column formula, as such a formula would be subject to possible variations as great as 28%. He stated that the Bureau of Standards, which had conducted the tests for the committee, could make no more such tests until after the war. He asked, therefore, that the committee be discharged, believing that if it was desired to continue the investigations after the war a new committee could be created. The society voted to accept the report with thanks, and discharged the committee.

Letter Ballot on Revision of Constitution

When the revision of the constitution was called for discussion, Nelson P. Lewis took the floor. He stated that while there were reasons for desiring that the constitution be revised, there were objectionable features to the present plan. Many of the changes he regarded as trivial, and some of them as distinctly undesirable. One of the latter was the new definition of eligibility to the society, which seemed to restrict engineering to responsible charge of construction work. He thought that would exclude men who had rendered valuable service in research work. He also objected to the proposed plan for disciplining members. While admitting that the present machinery for this purpose was cumbersome, he felt that the matter should not be left wholly to the board of direction without the constitutional right of the accused to be heard. He thought also that the plan for the creation of a small executive committee was objectionable. While he believed it unlikely that such a committee would abuse its power, he felt that it should be made impossible for this to take place.

For this and other reasons, he proposed a resolution that the matter be referred to the membership for letter ballot, accompanied by a copy of the discussion and a statement that the "sense of the meeting" was opposed to the revised version. There was no discussion of his remarks or of other phases of the proposition, and the resolution passed with a relatively small number of dissenting votes.

Prizes were awarded during the year as follows: Normal Medal, to B. F. Groat, for his paper "Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators"; J. James R. Croes Medal, to H. S. Prichard, for his paper on the effects of straining structural steel and wrought iron; Thomas Fitch Rowland Prize, to J. Vipond Davies, for his paper on the Astoria tunnel under the East River in New York City; James Laurie Prize, to H. R. Stanford, for his paper on the Pearl Harbor dry dock; Collingwood Prize for juniors, to C. E. Chase, for his paper on the Cherry Street bridge, Toledo, Ohio.

Officers for the coming year are elected as follows: President, Arthur N. Talbot; vice presidents, John F. Coleman and Nelson P. Lewis; treasurer, George W. Tillson; directors—District 1, George W. Goethals and A. M. Hunt; District 4, Samuel Tobias Wagner; District 9, E. E. Wall; District 10, Milo S. Ketchum; District 11, Harry Hawgood; members of the nominating committee—District 1, Charles E. Trout; District 2, Clarence Blakeslee; District 4, Robert Farnham; District 7, J. H. Darling; District 8, C. A. Morse; District 9, C. E. Johnston; District 12, Joseph Jacobs.

Secretary Houston Will Urge Vital Road Work

On Jan. 7 the American Association of Highway Officials, through its president, G. P. Coleman, Virginia state highway commissioner, sent to the Federal Government a set of resolutions requesting that it formulate and promulgate as soon as possible a definite policy to govern highway construction. On Jan. 11 reply of the Department of Agriculture was received by the association and proved to be most encouraging on many of the points upon which a decision was asked.

Secretary Houston said, in part: "So far as it is practicable to do so, this department will urge the maintenance of the roads already constructed; the construction and completion of those highways which are vitally important because of their bearing upon the war situation or for the movement of commodities; the postponement of all highway construction relatively less essential. . . . The department will do all in its power to place before the proper department all available information to aid in a practicable determination of the question of freight-car supply for the movement of road materials."

The resolutions of the American Association of Highway Officials were as follows:

Whereas, The proper construction and maintenance of the highways of the country is necessary to the successful conduct of the war; and

Whereas, The plans of all highway authorities in the country, all users of highways and all citizens interested in any way in highway construction and maintenance are at the present time upset and tied up; and

Whereas, There is need for a definite policy so that plans can be formulated for the coming year; and

Whereas, A properly outlined policy directing the construction and maintenance of such roads and streets as are of general economic and military value will conserve the resources of the country and will greatly facilitate the transportation of freight over highways and streets; therefore, be it

Resolved, That the American Association of State Highway Officials request the United States Government to formulate and promulgate, as soon as possible, a definite policy for road and street construction and maintenance, and

That it is requested that said policy contain a statement that freight cars shall be furnished next spring for the transportation of the necessary materials for the construction and maintenance of streets and roads of economic or military value.

Road Industries To Organize for Active Work

After conferring with the Office of Public Roads, the Highways Transport Committee and the executive committee of the American Association of State Highway Officials, the Highway Industries Association, which was tentatively formed in Detroit Dec. 28, will hold a final organization meeting in Chicago at the Auditorium Hotel, Jan. 21. At this meeting every facility and effort will be marshalled to the support of an economically sound program of highway construction and maintenance. This is in accord with the announced purpose of the association, which is as follows:

"The objects shall be to assist in coördinating the highways with the other transportation agencies of the country; to encourage the development of highways that will advance the economic life of the nation; to stimulate their use in such manner as to facilitate and cheapen the transportation of food, raw materials and finished products, and to coöperate with Government agencies, both state and national, to the end that our highways may be of maximum service in the transportation system of our country."

S. T. Henry, Colorado Building, Washington, D. C., is acting as secretary of the committee on organization.

Chicago Sanitary District Has New Plan

The trustees of the Chicago Sanitary District adopted Jan. 5 a plan under which they propose to contribute some $450,000 toward the construction by the Federal Government of submerged weirs in the Niagara and St. Clair Rivers, to raise the level of the water of the Great Lakes, provided the Government will discontinue its opposition to the withdrawal by the district of sufficient water to dilute the sewage of Chicago in its flow through the Drainage Canal to the Mississippi River.

Rapid-Transit Agreement Is Reached in Philadelphia

The Philadelphia Councils on Jan. 3 passed an ordinance carrying a 40-year contract with the Philadelphia Rapid Transit Co. for the operation of all surface and rapid-transit lines in the city. The Frankford elevated railway and all further rapid-transit lines are to be operated as soon as completed, and traffic exchange between these and the surface lines throughout the city is arranged. The agreement establishes complete community of interest between the city and the company. It provides for a board of supervisory engineers, three in number, to direct the planning, equipment and operation of the lines and to change the rates of fare whenever financial conditions require. This board will work under the approval of the State Public Utilities Commission.

Full guarantee of 5% earnings on the company's present capitalization of $30,000,000 is provided for, and dividend payments are strictly limited to this amount. Gross earnings are to be applied consecutively to operating expenses, taxes, fixed charges, rental to the city under the 1907 contract and a 5% dividend payment divided between city and company in the ratio of their capital interests. What is left over and above this amount is to be put into a surplus fund for covering the operations of less successful years. All payments have cumulative preference. The city may, however, at any time transfer part of the burden of fixed charges on its own investment to the taxpayer, thereby relieving the car rider. This is done by certification each year to the company by the city authorities of the amount of the city's capital interest which for the purposes of that year is to be taken into account.

Adjustment of the rate of fare is to be made by the board of supervisory engineers when the surplus becomes too large or too small. For the present, fares throughout the city are to be five cents with free transfers (abolishing the present three cents for tickets), except in the downtown district or "delivery zone," where the transfer tickets are retained. The company is to start operating the Frankford elevated railway as soon as completed, connecting it up with the Market St. subway.

The contract is to run for 40 years (to 1957), but there is provision for recapture of the entire system or part of the system by the city at any prior time. The contract still requires vote of the stockholders of the company to ratify it, but as it was drawn up in consultation between representatives of the city and the company it will probably be approved.

Scranton Puts City Engineer Under Civil Service

By a unanimous vote of the retiring City Council of Scranton, Penn., the office of city engineer of that city will hereafter be filled under civil service rules.

Abolishing Secrecy in Army Contracts

Indications in Washington Point to Change in Present Contracting Methods—Public Opinion Responsible

Secret buying of many classes of supplies for the army has been under fire in Washington for nearly a month, at hearings held by the Senate Committee on Military Affairs. Although the newspapers have reported some of the testimony, the importance of this investigation is little realized. There have been general complaints from manufacturers of construction machinery, building supplies, clothing and munitions, as well as from contractors, that they were given no opportunity to do business with the army, on account of its policy of secrecy, although there was no such difficulty in bidding on navy and marine corps supplies.

So long as only manufacturers grumbled, the public attributed the complaints to the chagrin of disappointed business men. But when thousands of young men sent to cantonments and camps wrote home that they had inadequate clothing, when it became known that there was an insufficient supply of certain classes of arms to enable the men to receive prompt training in their use, then the public took the matter in hand. During the recent recess of Congress, some of its members have been making personal investigations at camps and cantonments and others have been corresponding with men who know about the conditions of these young soldiers. And as a result, the Senate Committee on Military Affairs, which is one of the "strong" committees of Congress, has been trying to find out why the young soldiers have had to put up with deficient equipment and defective living conditions. Really, however, what is on trial before the committee is the system of secret contracting adopted by the Secretary of War at the instance of the Committee on Supplies of the Council of National Defense.

Reason for Present Policy

In the first annual report of the Council of National Defense, just made public, there is a detailed explanation of the reason for the adoption of this policy and the text of the order of the Secretary of War of Apr. 12, 1917, directing that contracts "for the supply and equipment of the army, for fortifications and other works of defense . . . will be made without resort to advertising for bids in the letting of the same." Further information concerning this order was given in the testimony of Charles Eisenman, of the Committee on Supplies, before the Senate Committee. He went to New York "to do a job" and found that news of what he was after had already reached the trade, so that he could not accomplish his purpose. He accordingly urged the adoption of a policy of partial secrecy concerning the work of his committee, so that while the trade would receive advance notice of the letting of contracts for the materials in which he was particularly interested it would not get enough information to enable combinations to be formed to advance the price of products or corner any market. This policy was adopted.

Under it, and by order of the Secretary of War, the committee designated what grades of supplies should be bought and who should get the contracts for them, the Quartermaster Corps merely drafting the form of contracts, signing them and inspecting the materials. Specifications for different classes of materials were prepared by the committee and submitted to manufacturers. In many cases the price which the Government would pay was fixed, and all the manufacturer could do was to agree to furnish a certain amount of goods of specified quality at a price fixed by the Committee on Supplies. Mr. Eisenman testified under oath that this policy saved the Government large sums, furnished supplies of good quality as rapidly as needed, and that shortages which might exist at camps were due to other causes than the system of buying without public advertising. A large amount of testimony was introduced to the effect that this system prevented the early delivery to the Government of supplies it needed, failed to utilize the manufacturing capacity of the country, caused a deterioration in quality of certain supplies, and did not, in fact, furnish supplies as promptly as claimed by Mr. Eisenman nor as promptly as was the case with the Navy Department.

At this writing the Senate Committee has not finished its hearings and its official report will probably not be ready for some time. But some members of the committee have already introduced bills which, if passed, will radically change the present system of purchasing army supplies. Consequently the time has come at last when there can be no objection to a public discussion of a policy which has caused great dissatisfaction among leading producers of army supplies of many classes.

Reason Against Present Policy

The claims for the present policy have already been stated. In favor of the policy of awarding contracts only after public advertisement, there is, first the statutory requirement for the use of this policy on Government work, which, it is held in some quarters in Washington, has been violated by the War Department's order of Apr. 12, 1917. A second claim in favor of publicity is that there can be no complaint of collusion or favoritism, such as is now rife over many army contracts. A third claim is that, under existing statutes, the products of any manufacturing plant can be commandeered if bid

prices are considered too high. A fourth claim is that where great difficulty is experienced in getting goods of a desired quality at an early date, as was the case with cloth for uniforms about eight months ago, the fact would become known publicly and available supplies of a better quality which could be delivered more quickly could be bought at a slightly higher price without receiving public condemnation as extravagant.

The objection most frequently urged against the policy is that it will entail a serious loss of time, which is met by the assertion that purchasing by the Navy Department under this policy has been far more prompt, efficient and satisfactory to the sellers than the policy of the War Department, although the purchasing for the latter was done by leading men drawn from many lines of business and that for the navy was directed by a former newspaper man.

The general opinion is that Congress will favor the abolition of the present purchasing system of the War Department, and will not only require publicity regarding contracts, but will give back to some Government agent or agencies the powers over contracts now vested in various subcommittees working under the Council of National Defense. Whether that agent should be a Director of Munitions or the several large divisions of the War Department is being warmly debated in Washington. The recent changes in the Ordnance Department would point logically to a trial of the latter plan for ordnance, while it is quite generally held that so far as the Quartermaster's Department is concerned, the record of General Goethals at Panama warrants giving him an opportunity to show if that department can be sufficiently freed from red tape to become an effective organization.

Congress will certainly take some action, for the families of the boys in the camps and cantonments will insist on reform and the changes under way are evidently a response to the public protest against past conditions.

Proposes Use of Men in Army Prisons on Roads

Bill in Congress Would Make Available Much Labor for Military Highway Work

Prisoners in the United States Army and Navy prisons can be employed in the construction of military roads and highways upon the passage in Congress of legislation introduced at this session by Senator Hoke Smith, of Georgia. This is not to be confused with such employment of prisoners of war, for which no legislation is needed.

The bill authorizes the Secretary of War and the Secretary of the Navy to employ military prisoners in the manufacture of war supplies and in the construction of military roads, to make agreements for the use of necessary machinery and the finding of available material, and to supervise the work of county and state highway officials who may be charged with the development of the proposed roads.

Army prisoners already are employed on road work within the cantonments of the National Army. The bill will make possible their employment on roads leading to the cantonments. In many instances the cantonments are without good road connections with the railroads and main highways, making the transportation of supplies difficult in bad weather.

Auxiliary Water-Supply for Jersey City

Bids for an auxiliary water-supply of 5,000,000 gal. a day for three years, with the privilege of calling for an additional amount up to 12,000,000 gal., have been authorized by the city commission of Jersey City, N. J., on recommendation of Commissioner Michael L. Fagen, director of streets and public improvements. The auxiliary supply is designed to tide the city over during the proposed construction of a duplicate supply conduit from the Boonton impounding reservoir on the Rockaway River. The existing conduit has a nominal capacity of 50,000,000 gal. a day under normal operation conditions. It is estimated that incrustation has reduced the capacity to 47,000,000 gal. By means of pressure reduction the conduit may carry 55,000,000 gal. daily. For the first 11 months of 1917 the average daily consumption was 53,540,000 gal. The storage at the city end of the conduit is small. During the recent below-zero weather there was a serious shortage of water, due to heavy waste designed to keep service pipes from freezing. On Feb. 5 the city will receive bids for duplicating the old conduit beneath the Passaic and Hackensack Rivers. Plans are under way for duplicating the whole conduit, but the estimated time for construction is about three years.

Transactions in Lieu of Convention

The first of the three numbers of "Transactions" of the American Society of Municipal Improvements, designed to take the place of the 1917 convention, has been issued by C. C. Brown, secretary, 2535 North Pennsylvania St., Indianapolis, Ind. The second number is scheduled for January and the third for April. The present number contains reports of the secretary, treasurer and finance committee for 1916-1917, a report from the committee on sidewalks and street design, and papers on sewage-sludge pressing, contract forms to meet war conditions, financing street improvements, and requisites of an equitable law for street improvements. Discussions of these papers and the submission of additional papers, from non-members as well as members, are solicited by the secretary.

Join Local Engineering Society First

Membership in Local Recommended as Prerequisite to Acceptance in National Societies

The executive board of the Cleveland Engineering Society approved on Jan. 7 a recommendation of its intersociety relations committee (B. A. Stone, chairman) that membership in a local engineering society be made a prerequisite of membership in the national engineering societies. The report follows:

"It is evident, from many printed articles in the technical press, from utterances of public speakers and from the official actions of many technical societies, local and national, that there is a widespread and growing conviction that engineers by their training and equipment are especially qualified to direct and administer public works and civic affairs to the better advantage of the entire community.

"It is essential for the successful conduct of such service that there should be efficient organization and unselfish coöperation of the entire body of engineers. The foundation units of such an organization must be the local societies. For the majority of engineers their local interests are of the first importance. These affect most directly their conditions of living and their social relations as members of the community.

"It is necessary for the engineers of each community to act as a body before any efficient nationwide coöperation can be effected. Therefore, the first essential is the formation of strong local engineering societies. The national societies should draw their strength from the whole body of engineers. The national societies and local societies should be mutually supporting and not competitive. The national societies will probably always be divided along professional lines. The national societies can best promote the advance of technical knowledge. For the prosecution of those wider activities technical lines should be ignored and the national societies brought into the closet relations with the all-inclusive local societies.

"To this end we respectfully suggest that the national societies consider as a prerequisite to membership that a candidate shall show membership in an accredited local society.

"Your committee asks the approval of the above recommendation by the society, that this report be published and its consideration urged upon other engineering bodies endeavoring to promote coöperation."

Schwab Put On Bethlehem City-Planning Commission

The new city commission of Bethlehem, Penn., has created a city-planning commission consisting of Charles M. Schwab, president, Bethlehem Steel Co.; W. A. Wilbur and three others. Mr. Schwab is credited with having often expressed the desire to make Bethlehem the model industrial city of the world.

Railway Engineers Who Fought at Cambrai

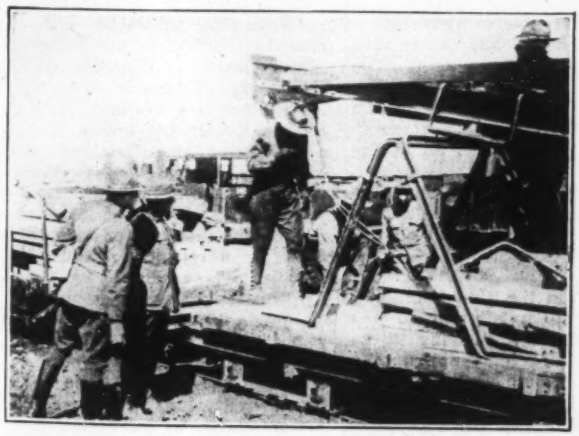
British Official Photographs

of some of the New Yorkers who dropped Spike Mauls for Rifles to help stem the late German drive

In this Group Besides CAPT. HULSART and LIEUTS. MCCLOUD and HOLSTROM at left, CAPT. H. W. HOLLAND (1), PRIVATE S. K. ALMY (2), CORP. WM. VAN V. STEPHENS (3), and SERGEANT MAC ISAAC (4), have been identified by friends and relatives.

Left to right, CAPT. C. R. HULSART, 1ST. LIEUT. PAUL MC CLOUD and 2ND. LIEUT. E. N. HOLSTROM.

SERGT. R. J. CAIROLA (left)
SERGT. now LIEUT. DONALD MAC ISAAC,
son of F. J. Mac Isaac, President of Smith, Hauser and Mac Isaac.



Recently one company laid ½ mile of standard-gage in 3 hr. 10 min., shortly after another beat this record by laying ½ mile in 2 hr. 45 min. The photograph shows narrow gage track-laying equipment.

The following extract from a letter written Mr. Mac Isaac by Col. Henry W. Hodge tells something about the battle:

"I want to write you a line of congratulation on the conduct of your son in the recent conflict with the Boches.

"Every one here says that but for his heroism and those who were with him from the.... Engineers, we might have had a serious fall back, but that he and Lieut. McCloud and a few others rallied their men and our allies and held the Boches. I hear the Allied Commander will probably give special recognition to this gallantry, and I am sure that you will be glad that your boy is one of the first to show that we Americans are going to do our part in this great struggle."

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Lower Court Rules Against Luten Patent

Complaint of Infringement of Five Bridge Patents Dismissed on Broad Grounds

The patent suit in which the State of Iowa, by special legislative enactment, took up the defense of an individual who was sued by Daniel B. Luten for infringement of certain of his concrete bridge patents, has been decided in the lower court against the patentee.

The suit was originally brought by Mr. Luten against the Marsh Engineering Co., Des Moines, Iowa, in 1912.

In 1913 the legislature enacted a law authorizing the governor to direct the attorney general to defend any suit involving the validity of a bridge patent, and pursuant to that law Henry E. Sampson, assistant attorney general at that time, was assigned to the case on behalf of the state. Wallace R. Lane, Chicago, was called in as associate counsel, and he finished the case as attorney for the defendant, together with H. M. Havner, the present attorney general.

Over 600 pages of printed testimony were taken, and 150 exhibits produced, including 15 miniature bridges which were made for the help of the court. On Jan. 3, 1918, Martin J. Wade, sitting as judge in the United States District Court for the southern district of Iowa, central division, dismissed the entire petition, involving eight of the Luten patents. Judge Wade's decision took up in detail four of the patents before the court, and the others were dismissed in the general ruling. Judgment was allowed against the complainant for costs. The specific patents mentioned by the judge in his decision were Nos. 852,970, 853,202, 853,203 and 934,411.

Judge Would Note Consent Decrees

The judge prefaced his decision with a criticism of "methods disclosed by the plaintiff in the business of constructing bridges or getting the business of designing bridges." He said, in part: "These methods no court can approve—some of them, at least. I am not sure but that they ought to be construed as sufficient to deny the party relief on the ground that he does not come into equity with clean hands. I refer especially to the half truths which are worse than falsehoods, in some of these representations made to contractors. Because when a man recites a list of cases as having been tried, or in which decisions have been rendered, without disclosing that nearly all of them have been consent decrees, it is not the truth. It is only half the truth. Those consent decrees should never have been utilized for any such purpose. It ought to appear upon their face stamped plainly 'by consent of parties,' and not be held out as the solemn action of the court which had never inquired into the facts at all." The judge further said that it was his opinion that in view of the disclosures in this case Congress ought to pass a law providing that the attorney general, or someone else, may institute a proceeding testing the validity of patents, settling the rights of parties on both sides, as to the validity and as to the construction of the patent.

As to the first group of claims under Patent No. 851,970, which provide for paving the bottom of the waterway under a bridge with a layer of concrete having a depressed end, the judge denied the validity of the claims on the ground that such paving, or such a handling of stream beds, was not new at the time the patent was granted. He said further that it did not need inventive genius to vary the details of that paving, as was done in the patent. The second group of claims under the same patent relates to the extending of spandrels and wing walls to a distance and height sufficient to hold the earth fill from escaping at the ends at the spandrels. The judge here stated that while he could not determine the particular things claimed as an invention, he could find no patentable novelty in the idea.

Design Is Not Invention

Judge Wade emphasized the difference between design and invention and pointed out that in judging whether things involve inventive genius the state of scientific knowledge in the work undertaken has to be considered. In his comment on Patent No. 853,202, which relates to a provision of tension members over the extended wall of an abutment to strengthen the structure at that point, the judge held that no variation in methods of reinforcement is patentable. The disposition of reinforcement, he said, is a matter of computation and one which any skilled engineer should be able to perform. If one man is more skillful than another and better able to figure out a certain method, he should not receive the monopoly rights of a patent. The same argument related to Patent No. 853,203, the claims of which are on a method of reinforcing a concrete arch. Here the judge stated that there may be some invention in this patent, but it is only for the particular arrangement of steel noted in the claims, and the bridge in question did not infringe this arrangement.

The final patent, No. 934,411, claims an improvement in the art of building a concrete wall up to a proposed line of projecting coping, allowing it to harden and then aligning the forms for the coping and completing it. The judge said that this was merely a form of camouflage and that there is nothing patentable in it.

A Protest from the Plaintiff

Mr. Luten has written *Engineering News-Record* protesting against one part of the decision. He says, in part:

"The court stated that consent decrees should have been stamped on their faces 'By consent of parties.' Not only has every decree to which I have given circulation been a certified copy of the decree as entered, but every decree obtained by consent has plainly stated that fact on its face, just as the court says should have been done. This is a fact which clearly appears in the record before the court. If the court had examined the record he would have found that I had done exactly as he says I should have done.

"In the case of Thacher vs. Polk County (235 Fed., 724) this same court held in 1916 that Thacher was estopped from maintaining suit for infringement because he had not warned infringers of the rights he was seeking to enforce against Polk County.

"The remarks of the court to the effect that Congress should enact a law giving the Attorney General power to proceed to test the validity of patents apparently overlooked the fact that the Attorney General has always had power to maintain suit to set aside and cancel patents on the very grounds that were charged against me by the counsel for the State of Iowa. The United States Supreme Court has decided that the Attorney General may bring suit in the name of the United States where a patent for a grant of any kind issued by the United States has been obtained by fraud, by mistake or by accident, or where there is any error in the patent itself capable of correction (128 U. S., 315, and 159 U. S., 548).

"I have given abundant opportunity for anyone to contest the validity of my patents, for I have filed 48 suits in all and have 27 pending at the present time. My litigation has not yet progressed beyond a few decisions in the lower courts, although I now have four cases pending in the Circuit Courts of Appeal."

Research Fellowships Open at Illinois University

At the close of the current academic year 12 fellowships are to be filled in the Engineering Experiment Station, University of Illinois. In addition to these, there are available two research fellowships in gas engineering in the same station, these last being supported by the Illinois Gas Association. For each of these fellowships is provided an annual stipend of $500, and all graduates of approved American and foreign universities and technical schools are qualified as applicants. Appointments are made and must be accepted for two consecutive college years, at the expiration of which time, if all requirements have been met, the degree of Master of Science will be conferred.

Nomination to these fellowships, accompanied by assignments to special departments of the engineering experiment station, will be made from applications received by the director of the station not later than the first day of February, this year. Preference is

given to those applicants who have had some practical engineering experience following their undergraduate work, but character, scholastic attainments and promise of success are considered.

Dean C. R. Richards has been informed by Dr. S. P. Capen, of the U. S. Bureau of Education, that the office of the Chief of Engineers has ruled that resident graduate students in engineering, who are candidates for an advanced engineering degree, may avail themselves of the privileges provided by the new regulations under which engineering students may be enlisted in the Enlisted Reserve Corps of the Engineer Department, and placed on the inactive list until they have completed their educational training.

Two Rapid-Transit Routes Recommended for Pittsburgh

Consideration of two rapid-transit lines in Pittsburgh form the main feature of a report just made by E. K. Morse, the city's transit commissioner, to the Council. One is to connect the South Hills district with the East End, extending from the south end of the present Mt. Washington tunnel through the tunnel, across the Monongahela River at Smithfield St., along Water St., Grant St., Penn Ave. and Frankstown Ave. to Dallas Ave. This line is to be built first. Later a line connecting the North Side with Schenley Park by way of West Diamond St., Dasher St., a bridge over the Allegheny River, Stanwix St., Diamond St., Forbes St. and Fifth Ave. is to be built.

The first line, 7.23 miles long, is largely elevated. Its cost is estimated at $7,000,000. The second line is largely in subway or tunnel, and is of considerably higher cost.

New England Water-Works Association Elects Officers for 1918

The candidates nominated for office by the nominating committee of the New England Water-Works Association were all elected by letter ballot without opposition. Carleton E. Davis, chief of the Bureau of Water, Philadelphia, was elected president; Willard Kent, civil engineer, Narragansett Pier, R. I., secretary, and Henry A. Symonds, hydraulic engineer, Boston, editor.

All of the other officials, the complete list of which was printed in *Engineering News-Record* of Nov. 8, 1917, p. 902, were elected.

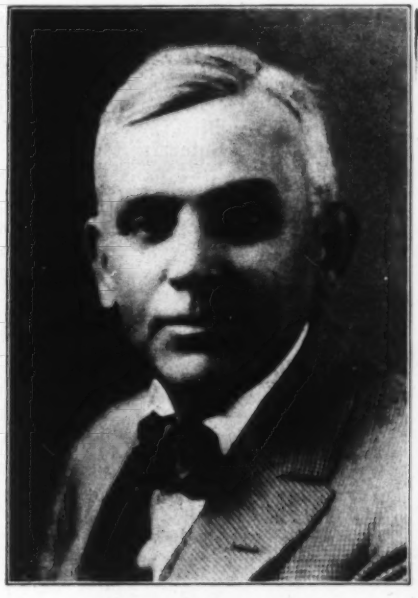
Road Builders To Hold Convention at St. Louis

The American Road Builders' Association will hold its annual meeting at St. Louis, Feb. 4 to 7, and the Missouri State Highway Department has decided to have its first "road week" at the same time and place. The department will have a laboratory in use for free testing of samples of rock and gravel, and will illustrate the road work of the Missouri convict camps.

Western Society President-Elect To Promote War Activities

Charles B. Burdick, president-elect of the Western Society of Engineers, purposes that his administration shall give full support in every way possible to military activities. One activity proposed is to enlarge greatly the employment bureau recently inaugurated.

Mr. Burdick was graduated from the University of Illinois in 1895, and began engineering work as assistant engineer to Alvord & Shields, consulting engineers, engaged principally on sewerage work. In 1897 he became assistant engineer to John A. Cole and from 1901 to 1902 was associate in the firm of John A. Cole & Son, consulting hydraulic engineers. In 1902 he entered into partnership with John W. Alvord.



CHARLES B. BURDICK

Some of the activities with which he has been connected are the complete water-works at Gary, Ind.; twenty years' work on the water-supply at Des Moines, Ia.; complete new water-works at La Crosse, Wis.; filter plants at Evansville, Ind., and Niagara Falls; flood protection reports for the Franklin County Conservancy District, Ohio, and for the Illinois Rivers and Lakes Commission. His latest work was done in connection with the construction of the Camp Grant cantonment at Rockford, Ill., his firm supervising water-supply, sewers and roads.

He has been a member of the Western Society of Engineers since 1901 and has served two years on its board of direction, one year as chairman of the hydraulic, sanitary and municipal section and one year as second vice president. He is a member of the American Society of Civil Engineers, the American Water-Works Association, the Illinois Society of Engineers, the Chicago Engineers' Club and the University Club of Chicago.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 West 39th St., New York; Jan. 16 and 17, 1918, New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION; Baltimore, Md.; Jan. 22-24, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 910 Michigan Ave., Chicago; Mar. 20-22, Chicago.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 21-23, Montreal.

AMERICAN INSTITUTE OF MINING ENGINEERS, 29 West 39th St., New York; Feb. 18-21, New York.

AMERICAN CONCRETE INSTITUTE; 27 School St., Boston; Feb. 7-9, Chicago.

The next meeting of the Harvard Engineering Society of New York will be a smoker at the Harvard Club, Jan. 18. George F. Porter, engineer of construction of the St. Lawrence Bridge Co., will give an illustrated talk on the Quebec Bridge, and will also cover other types of bridges proposed, with a brief discussion of the merits of the various types and reasons for the selection of the present type.

The regular monthly meeting of the **Engineers' Club of Trenton, N. J.,** was held Jan. 10. The feature of the evening was a "Description of the New Power Plant of the Erie Lighting Co., at Erie, Penn.," by J. B. Scott, of Day & Zimmerman, Inc., illustrated with lantern slides. The club announced that in keeping with the spirit of the times the place of the annual banquet would be taken this year by a collation and smoker, on Jan. 24.

The Brooklyn Engineers' Club held its regular meeting for January on Jan. 10, and listened to a paper on "Car Float Transfer Bridges in New York Harbor," by James B. French. On Jan. 24 V. T. Goggin, engineer for Fred T. Ley & Co., builders of Camp Devens, Massachusetts, will address the club on the construction of the cantonment. The address will be illustrated with lantern slides.

The Yakima Engineers' Club of Yakima, Wash., at its first regular meeting, Dec. 29, discussed the importance of standard specifications for wood stave pipes, and creosoting thereof. Modern and up-to-date specifications are now entirely lacking, for general use of engineers and manufacturers. A committee, consisting of E. M. Chandler, chairman; T. A. Noble and C. F. Gleason, was appointed by President R. K. Tiffany, to prepare such specifications for consideration of the club.

meeting, listened to a paper B. D. Davis presented on "Modern Science." It was decided that the association shall have an exhibit at the first territorial fair. At the January meeting of the association a paper on "Tides" would be read, it was announced, by Charles B. Willard, United States engineer, who has been connected with breakwater work for many years.

The annual meeting of the New Jersey Sewage Works Association will be held in the State House in Trenton, Feb. 15. The program arranged includes an address on "The Operation of Small Sewage-Disposal Plants," by George W. Fuller, of New York City; a paper, "Difficulties Experienced and Overcome in the Operation of the Madison-Chatham Plant," by Paul Molitor, Chatham, N. J.; a paper on "The Operation of Sand Filters at Newton Under Winter Conditions," by Morford C. Smith, Newton, N. J., and one on "Sewage-Disposal Plant Operation in England," by Joshua Jamison, East Rutherford, New Jersey.

The American Association of Engineers, Chicago Chapter, Jan. 4, elected the following officers: President, T. B. Lambert; vice presidents, Paul Augustinus and Ferdinand Oudin; secretary, Robert W. Shelmire; treasurer, L. O. Wolf. S. A. Greeley, consulting engineer, Chicago, gave an illustrated address on "Housing the National Army," and John J. O'Leary, president of the Chicago Association of Commerce, spoke on "Patriotism and Production."

A joint meeting of the **Pittsburgh Sections of the Association of Iron and Steel Electrical Engineers** and the **American Institute of Electrical Engineers** will be held at the Hotel Chatham (old Hotel Lincoln), Pittsburgh, Jan. 19. Papers will be presented on the "Generation, Distribution and Consumption of Power," by B. W. Gibson and B. A. Cornwell, of the Ohio Works of the Carnegie Steel Co., Youngstown, Ohio, for the A. I. and S. E. E. "Methods of Power Factor Correction" will be discussed by R. A. McCarty, power engineer, Westinghouse Electric and Manufacturing Co., on behalf of the A. I. E. E. At the next regular meeting of the Philadelphia Section, A. I. and S. E. E., Feb. 2, the subject will be "Mill Type Transformers," by H. G. Steele, of the Pittsburgh Transformer Co., Pittsburgh. The next meeting of the Cleveland District Section will be held Jan. 26. The Pittsburgh Section will hold its February meeting at the Hotel Chatham, Feb. 16, and will listen to a paper on "A. C. and D. C. Skip by Hoists," by Mr. Lindquist, of the Otis Elevator Company.

The Michigan Engineering Society will hold its annual meeting at Grand Rapids, Jan. 29-31.

The annual meeting of the Municipal Engineers of the City of New York, to which ladies are invited, will be held in the Engineering Societies Building, 29 West 39th St., at 8.15 p.m., on Jan. 23. The business meeting will be followed by a lecture and entertainment.

The Washington Chapter, American Association of Engineers, met Jan. 7 for the first time since being chartered. A. P. Connor, secretary, was directed to edit and publish a journal to outline the work of the association. A committee was appointed to select a permanent club and meeting quarters. Several members spoke on the growing importance of engineers in the war.

The Carolina Association of Highway Engineers was recently organized by the highway engineers of North and South Carolina and the following officers were elected: R. T. Brown, president, Columbia, S. C.; W. M. Peyton, vice president, Rutherfordton, N. C.; N. C. Hughes, vice president, Gaffney, S. C.; N. S. Mullican, secretary, Lexington, N. C.; A. F. Brown, treasurer, Greensboro, N. C. The first regular meeting will be held at Chapel Hill, N. C., Feb. 20.

PERSONAL NOTES

JOHN T. FETHERSTON, commissioner of street cleaning, New York City, from August, 1914, to Dec. 31, 1917, has accepted the position of construction manager with the Air Nitrates Corporation, which is building an ammonium nitrate plant for the U. S. Government at Muscle Shoals, on the Tennessee River in Alabama, at an estimated cost of $30,000,000. Mr. Fetherston declined a temporary reappointment as street cleaning commissioner by Mayor Hylan.

THE MOODY ENGINEERING CO., Inc., formerly at 115 Broadway, is now at 90 West St., New York.

County Engineer SHINN, of Ocean County, New Jersey, has resigned his position to become assistant division supervisor of road work for the State Road Department. His division will include Ocean County.

ROGER W. OLMSTED has been appointed chief engineer of the South San Joaquin Irrigation District, California, succeeding A. GRIFFIN.

J. B. STOCKING has resigned as Carey engineer for the State of Idaho and has accepted the position of water master for the North Side Canal Co., Jerome, Idaho.

HERMAN SCHNEIDER, dean of the College of Engineering of the University of Cincinnati, and father of the "coöperative system" of engineering education, has been granted a leave of absence, and has been commissioned major in the Ordnance Department. He will be stationed at Washington, and will be in charge of the Industrial Service Division, which assists in caring for the labor needs and handling the labor problems in arsenals and in plants having ordnance contracts.

HERBERT SPENCER, engineer in the asphalt division of the road department of the Standard Oil Co. of New Jersey, has been commissioned captain in the Engineer Officers' Reserve Corps, and has been assigned to the engineer training camp at Camp Lee, Petersburg, Virginia.

RUDOLPH J. WIG, in charge of concrete tests and investigations of the Bureau of Standards, has been granted a leave of absence in order to assist in the concrete ship division of the Emergency Fleet Corporation. W. A. SLATER, formerly of the University of Illinois Engineering Experiment Station, who has been assisting Mr. Wig in his concrete ship studies at the Bureau of Standards, has likewise been transferred to the same division.

E. S. BORGQUIST, Salt Lake City, Utah, has received a commission as first lieutenant in the Engineer Officers' Reserve Corps.

FRANK M. MASTERS, inspecting engineer, Harrisburg, Pa., has been commissioned major in the Ordnance Officers' Reserve Corps.

W. B. MCARDLE has been appointed division engineer of the Central New England Ry., with headquarters at Poughkeepsie, N. Y., succeeding J. H. Gallivan, transferred to the middle division, New York, New Haven & Hartford R.R., at Boston.

JOHN W. TOWLE, Omaha, Neb., is now plant engineer with the U. S. Shipping Board at the Hog Island Shipbuilding plant of the American International Shipbuilding Corporation.

ROBERT CAMPBELL, engineer of erection for Milliken Bros., is now connected with the Downey Shipbuilding Corporation, at Arlington, Staten Island, New York.

E. MCLEAN LONG and FRANK MILLER, 13 Park Row, New York City, have dissolved their partnership and will continue in the practice of engineering under their individual names, with offices at the same address.

J. W. CRUIKSHANK, consulting engineer, Pittsburgh, Penn., has been commissioned a captain of engineers, and is now at Camp Lee, Petersburg, Virginia.

JOHN W. F. BENNETT, after eight years' service with the City of New York, first as deputy commissioner of water supply and later as consulting engineer, is now associated with ERNEST P. GOODRICH and A. PEARSON HOOVER, consulting engineers.

BISHOP MOORHEAD, of Las Animas, N. M., has received a commission as second lieutenant in the Engineer Officers' Reserve Corps.

B. G. McBRIDE, assistant state engineer of Nevada, left Jan. 1 for Washington to take examinations for a commission in the ordnance department.

J. G. SCRUGHAM, state engineer of Nevada, was recently commissioned as major in the ordnance department.

CHARLES E. WHITNEY, formerly chief inspector at Pittsburgh, Penn., for Modjeski & Angier, inspecting civil ngineers, is now a first lieutenant in the Ordnance Officers' Reserve Corps, and has been assigned to inspection duty in New England.

L. V. MANSPEAKER, assistant engineer, Chicago and Alton R.R., at Springfield, Ill., is now a captain in the Engineer Officers' Reserve Corps.

LEWIS HALL, Morrisville, N. J., has been appointed borough engineer for a period of one year. He succeeds THOMAS B. STOCKHAM.

CHARLES P. COLE, Prince Bay, N. Y., has been appointed superintendent of sewers for the Borough of Richmond, New York City.

ROBERT L. FOX, Philadelphia, has been appointed city engineer for Bethlehem, Pennsylvania.

DABNEY H. MAURY, hitherto acting as consulting engineer in the cantonment division of the Quartermasters Department, has been commissioned a major and assigned to active duty in the cantonment division.

KARL R. KENNISON has left the designing division of the Water Supply Board, Providence, R. I., and has been appointed supervising engineer, Bureau of Yards and Docks, Navy Department. He has been detailed for duty at the Blake & Knowles Pump Works Extension, East Cambridge, Massachusetts.

MAJ. FREDERICK MEARS, who has been a member of the Alaskan Engineering Commission for the past three years and in charge of the work at Anchorage, has been relieved, at his own request, of the duties in connection with that position. Maj. Mears had been specially detailed to the Alaska R.R. work from the War Department, but felt that in the present time of stress he should return to the Army. The War Department is to commission him a colonel and place him in command of the engineering regiment which is to be engaged in railroad work in France.

WILLIAM GERIG has been appointed engineer in charge of the Anchorage Division of the Alaska R.R., under the supervision of WILLIAM C. EDES, Chairman of the Alaskan Engineering Commission. Mr. Gerig has been for the past two years with the commission in the capacity of consulting engineer, and previous to that time had been for many years vice president and chief engineer of one of the Hill lines in the Northwest. He had also been for some time with the Panama Canal as engineer in charge of one of the construction divisions.

CHARLES E. COOKE, of the U. S. Geological Survey, Washington, D. C., has been commissioned major in the Engineer Officers' Reserve Corps.

MALCOLM McLAREN, of Princeton, N. J., is now Captain McLaren of the Engineer Officers' Reserve Corps.

R. E. SPEAR has accepted the position of assistant engineer to R. W. ROBERTS, who is district engineer of the Michigan State Highway Department.

W. R. HOLWAY has resigned as sanitary engineer in charge of the water purification plant and the sewage disposal plant of Alliance, Ohio, and is now in charge of the new filtration and softening plant of the City of Tulsa, Oklahoma.

K. I. STEARNS has left the position of assistant hydraulic engineer at the Massena, N. Y., station of the St. Lawrence River Power Co., and is connected now with the engineering department of the American Sheet and Tin Plate Co., Pittsburgh.

M. H. TURNER, former service director, was elected city manager of Ashtabula, Ohio, to succeed J. WARREN PRINE.

WIHTRED COOK, formerly with the engineering department, Rochester Railway and Light Co., Rochester, N. Y., is now with the hydraulic engineering department, Aluminum Co. of America, Pittsburgh, Pennsylvania.

CALVIN E. COCK, formerly of Fort Worth, Tex., is now at Spur, Tex. He has been appointed engineer on a $400,000 road bond issue recently voted in Dickens County, Texas.

JAMES H. REDING, formerly assistant engineer for R. Winthrop Pratt, consulting engineer, Cleveland, Ohio, is now captain of A company, 112th Engineers, at Camp Sheridan, Alabama.

LOUIS F. HAFFEN, at one time president of the Borough of the Bronx, New York City, has been appointed consulting engineer of the borough.

WALTER E. SANFORD, formerly with the Public Service Commission, New York, First District, is now with Mason & Hanger-MacArthur Bros., at the Port Newark Terminal, Port Newark, New Jersey.

A. S. MIRICK, formerly of Denison, Iowa, is now in the office of the Nebraska state engineer, Lincoln, Nebraska.

FRANCIS E. DANIELS, assistant engineer with the Pennsylvania State Department of Health, has been commissioned captain in the Sanitary Corps of the National Army, and has been assigned to Camp Greene, Charlotte, North Carolina.

CAPT. F. R. SCHANCK, who has been commissioned in the Ordnance Department, has been assigned to duty as chief of the district of the production section, carriage division, Chicago. Capt. Schenck had been connected with engineering work on the irrigation operations of the Interior Department for a number of years, and at the time of being commissioned was assistant chief engineer, and also in charge of mechanical engineering for the irrigation work at the Indian Bureau.

CHARLES J. BOLAND, for the past two years constructing engineer of C. P. Boland Co., engineers and contractors, Troy, N. Y., is now first lieutenant in the Signal Corps, Construction Department, "Somewhere in France" with the American expeditionary forces.

CAPT. CHARLES GARTENSTEIN, who was until recently engineer of design in the office of the President of the Borough of the Bronx, New York City, is now a member of the Engineer Officers' Reserve Corps, and has been assigned to the officers' training camp at Petersburg, Virginia.

HARRY C. DUDLEY, Duluth, Minn., and ABNER GILE WITHEE, Watertown, Fla., have been commissioned captains in the Engineer Officers' Reserve Corps.

CHARLES HERBERT SWEETSER, of the U. S. Office of Public Roads, Washington, D. C., has received a commission as captain in the Engineer Officers' Reserve Corps.

FREDERICK H. KRUGER, Alameda, Calif., and WHITNEY NEWTON, Dulce, N. M., have received commissions as first lieutenants, Engineer Officers' Reserve Corps.

SANFORD E. THOMPSON, consulting engineer, Boston, Mass., has been commissioned a major in the Ordnance Department of the Army.

LEO F. CAPRONI, formerly with the National Bridge Works, New York, is now with the New York office of the Bethlehem Steel Company.

BYRON J. LAMBERT, professor of structural engineering in the State University of Iowa, has been commissioned major with the 23d (Highway) Engineers and is now at Camp Meade, Maryland

W. L. MALONEY, supervising engineer on the construction of Camp Grant, has now received his commission as Major in the Quartermasters Department of the National Army and been assigned to the Cantonment Division.

H. H. TRACY, city engineer of Norfolk, Neb., has closed his office and joined the colors in the capacity of first lieutenant of the Engineer Officers' Reserve Corps. He is at Camp Lee, Va., for a three months' training course.

B. J. T. JEUP, who has been city engineer of Indianapolis during the administration of Mayor Joseph T. Bell, the present incumbent, and who retired from office Jan. 14, has been appointed chief engineer of the Indianapolis Water Co. Mr. Jeup has been serving the City of Indianapolis as assistant city engineer or city engineer during several administrations.

OBITUARY

JAMES MACDONALD, age 107, Canada's oldest contractor, builder of many large docks and wharves, and of many big grain elevators, died at Collingwood, Ont., recently.

SAMUEL J. STILWELL, electrical and construction engineer and grading contractor, a resident of Seattle, Wash., for 28 years, died Dec. 25. Mr. Stilwell was 58 years old and was active in contracting circles. In early days in Seattle, he was superintendent of the Bell Telephone Co. His greatest work in Seattle was the regrading of Denny Hill, as member of the firm of Grant, Smith & Stilwell. Stilwell Bros. also graded that portion of the Lake Washington Government Canal between Lake Washington and Lake Union.

GEORGE W. RAPP, senior member of the firm of Rapp, Zettel & Rapp, architects, died at his home in Cincinnati, Ohio, Jan. 10, at the age of 66 years. Mr. Rapp was a charter member of the Cincinnati Chapter, American Institute of Architects, and during the years 1912 and 1913 was building commissioner of the City of Cincinnati. During his term of office the Housing Department for the inspection of tenements was organized, and he also conducted an active campaign of careful inspection of amusement places which resulted in increasing the standard requirements governing theaters.

INDUSTRIAL NEWS AND COMMENT

Good Roads Are Urged by Motor Truck Men

Manufacturers in Convention Emphasize Need for a Strong Construction Program To Promote War-time Hauling

"Although $1,800,000,000 has been spent on highways in the United States during the last ten years, we are totally lacking in adequate motor-truck routes between our large cities and distributing points," said Roy D. Chapin, chairman of the Highways Transport Committee of the Council of National Defense, addressing the Motor Truck Manufacturers' Convention in New York, on Jan. 8.

There were 110 delegates present, representing 70 manufacturers of motor trucks. The keynote of the meeting was war service. Resolutions were adopted tendering the services of the motor truck manufacturers to the President, to the Secretary of War and to the Council of National Defense. A program of constructive motor-truck legislation was outlined, and resolutions were passed to further this work.

Spirited discussion dealt with the vital need for immediate and widespread good road construction to expedite the war work of the nation by relieving traffic congestion. Several noted speakers dwelt upon this phase of wartime construction.

Mr. Chapin's address was upon the work of the Highways Transport Committee of the Council of National Defense. He outlined the great need for transportation and adequate roads properly maintained, in order to win the war. In selecting a route for the overland transport of army motor trucks, he stated, there were encountered many gaps of impassable roads which had to be rebuilt and other stretches which had to be repaired. In one or two states there were good roads, suitable for a through route, which were not charted on the state highway maps.

TRUCKS TO CARRY SHIP'S PARTS

Further need for permanent road construction of a type to withstand the heaviest traffic was evidenced by the fact that the Highways Transport Committee of the Shipping Board has asked that the war trucks which are being driven overland shall carry the parts of ships now urgently required at the Atlantic seaboard.

Coöperation between highway engineers and the motor-truck industry in the design and construction of modern highways was urged by George C. Diehl, chairman of the Good Roads Committee of the American Automobile Association.

"Motor truck roads," said Mr. Diehl, "must be built on the shortest practicable route in order to cut the cost of truck freighting to a minimum. Volume of traffic, grades and load distribution on the trucks must be considered before the width and type of road are chosen. Bridges should be taken out of the control of counties and placed under state or Federal jurisdiction. Many of our present bridges are unable to carry loads which may be transported over the roads, due to county control of bridge work.

ROADS MUST WITHSTAND HEAVY TRAFFIC

"The roads of today must be built with a concrete base and a top that will withstand the heavy loads of motor trucks."

Parallel roads to care for important intercity traffic were pointed out by Mr. Diehl as a modern need.

S. M. Williams, of the Garford Co., also appealed for the immediate building of national highways able to care for motor-truck traffic. During the next year the increased freight hauling by motor truck will be too much for the present system of highways to withstand.

"Legislation Affecting Use of Motor Trucks" was covered by Windsor T. White, chairman of the National Automobile Chamber of Commerce Commercial Vehicle Committee. Mr. White asked for a Federal statute controlling motor-truck operation in every state.

At present motor trucks of a type free to operate in one state are barred by local laws from working in other states.

Coöperation between the motor-truck manufacturers and the state and national associations interested in highway development was urged by Mr. White.

Maj. Edward Orton, Jr., Quartermasters Corps, U. S. A., told of the great work of driving 30,000 motor trucks overland, of which the first convoy has just gone through. "One great benefit of these 'drive-aways' will be the enlightenment of the citizens regarding the need for overland motor routes capable of withstanding motor-truck traffic," said Major Orton. "It will make clear, too, the necessity for roads that actually lead somewhere and do not branch out to obscure points, as do roads built under individual road-building programs of our several states. This need has long been evident, but these war trucks will help to bring it to the fore and result in the great development of our national highways."

For the Man Who Is "Sold Up"

An interesting suggestion to the manufacturer who is "sold up" was made the other day by a man who is in close touch with the industrial field.

"Good operators for trenching machines, steam shovels and locomotive cranes are scarce and becoming scarcer," said he. "Equipment at work now is not getting the skilled attention that it needs to get the most service out of it. Used or second-hand equipment that has changed several times is likely to deteriorate fast.

"In consequence, I believe that it would pay the manufacturers to keep a skilled service man on the road to follow up the machines that have seen several years' use. Let him show the operator how to 'hunt trouble' on the machine, how to make simple repairs and adjustments, when to 'shop her' and how to instruct the shop force regarding repairs, for the shop mechanics in the average organization contain a big percentage of green men these days, too.

"This field service will prolong the life of the equipment, thus adding to war-time conservation of materials. It will also be a powerful factor in building good will for the manufac-

turers of construction equipment who adopt it. To the manufacturer who is 'sold up' this good will, particularly among second-hand owners, is a valuable asset."

These comments seem worth while passing along to the readers of this page. It would be interesting to hear from manufacturers who are already working along these lines.

Licenses Required for All Shipments of Wire Rope

A notice has been issued by the War Trade Board regarding exports of wire rope, classified as galvanized wire, without an export license. The attention of shippers is called to the fact that export licenses are required for all shipments of iron and steel wire rope, cable and strands consisting of six or more wires, whether or not the wires are painted, galvanized or coated in any way, and that it is necessary to obtain an export license for every shipment of this material. Notice is also given that the act of improperly classifying material in order that it may be exported without a license subjects the exporter to the penalty of the law.

Notes of the Industries

H. Y. Smith, engineering superintendent for James Kennedy, contractor, Fargo, N. D., has joined the staff of Kern-Hunter, Inc., dealer in contractors' equipment, Milwaukee. Mr. Smith was in the contracting business in New Jersey for 12 years. J. N. Young, formerly Chicago manager for the Mechanical Appliance Co., is handling the Central Wisconsin territory for this company.

The Frampton Window Shade Co., Pendleton, Ind., has been succeeded by Hamilton Manufacturing Co., Anderson, Ind.

After an existence of nine years as a department of the Chicago Pneumatic Tool Co., the motor truck interests of the company were taken over on Jan. 1 by a new organization known as the Little Giant Truck Co. The latter is owned and controlled by the Chicago Pneumatic Tool Co. and the officers are the same, W. O. Duntley, president; W. B. Seelig, secretary and L. Beardsley, treasurer, with T. J. Hudson, sales manager. The headquarters will remain in the Little Giant Building, 1615 Michigan Ave., Chicago.

Ralph C. Davison, for the past six years associated with the American Mason Safety Tread Co. in a selling and engineering capacity, has resigned his position and directorship to become associated with the American Abrasive Metals Company, makers of Feralun Safety Treads and Anti-Slip surfaces. Mr. Davison, through his connection with the Concrete Association of America, has a large acquaintance among architects and contractors, and as associate editor of the "Railroad Gazette" made many friends among railroad men.

The Marsh-Capron Manufacturing Co., Chicago, manufacturers of the Marsh-Capron "rail track" mixer and other concrete machinery, has "Linked up with Lakewood" (as the Lakewood slogan has it). The Lakewood "M-C Line" will be the new name of the company's equipment.

J. D. Cardinell announces that he has purchased the vellum manufacturing department of the Cardinell-Vincent Co., which he has organized to manufacture and distribute vellum paper exclusively, under the name of the Cardinell Vellum Manufacturing Company.

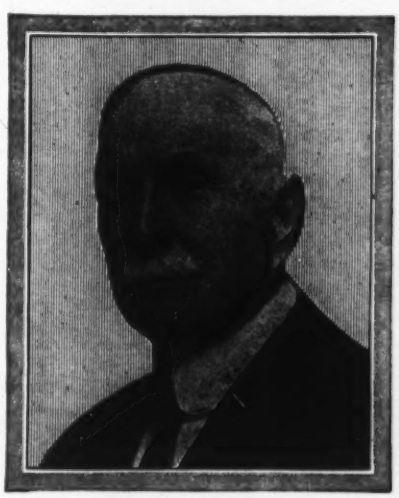
The Glauber Brass Manufacturing Co., of Cleveland, plans to erect a reinforced concrete building, 150 x 300 ft. The building will be required for occupancy on Apr. 1.

On Jan. 1 there were 1417 stars in the service flag of the American Sheet and Tin Plate Company.

Christopher W. Levalley Dead

Christopher W. Levalley, founder and chairman of the board of directors of the Chain Belt Co., died suddenly of heart failure at his home in Milwaukee, Jan. 4.

Mr. Levalley was born at Manchester, Conn., in April, 1835, and received his education in the schools there. When 14 years old he moved to Hartford, Conn., where he served an apprenticeship in a machine shop. At the outbreak of the Civil War he enlisted in the army. After the war he went to St. Paul as superintendent of the St. Paul Harvester Co., later becoming general manager. It was at this time that he saw the necessity of a positive drive for harvesting machinery, and in 1891 he went to Milwaukee, where he established the Chain Belt Company.



CHRISTOPHER W. LEVALLEY

In 1907 Mr. Levalley conceived the idea of driving a concrete mixer with a steel chain and using a cast semisteel drum. These ideas were incorporated in what was known then as the Chain Belt Mixer, but which name has since been changed to Rex Mixer.

Mr. Levalley was 82 years old last April. From 1891 until 1917 he was president and general manager of the Chain Belt Co. In 1916 he was elected chairman of the board of directors and held this position to the time of his death. He was also interested in the C. O. Bartlett & Snow Co., Cleveland, and the Federal Malleable Co., Milwaukee.

Mr. Levalley gave generously to charitable institutions and only within the past year gave $100,000 to the Milwaukee Foundation.

J. Howard Murray, former owner of the Trenton Vise and Tool Works, died in Trenton, Dec. 18. Mr. Murray was also formerly associated with his son, Gen. C. Edward Murray, in the Crescent Insulated Wire and Cable Co.

TRADE PUBLICATIONS

"The Modern Freighter" is the title of a folder issued by the United States Motor Truck Co., illustrating the work of United States trucks on intercity hauls.

"My Dear Jim" is the title of a pamphlet just issued by the Carnegie Steel Co. It is as good as it sounds. As P. B. Woodworth, advertising manager, says in his accompanying letter, the Carnegie Steel Co. yearly prints and distributes 23 publications, each covering a specific field in detail. The new pamphlet is intended to make clear the full scope of the company's activities in a wide range of specialized fields. The facts are interesting and of a nature seldom presented in a trade publication.

"How To Make and Use Concrete" is the title of a handbook issued by the Ransome Concrete Machinery Co., 115 Broadway, New York. The author is H. Colin Campbell, C. E., E. M. A wide range of concrete construction and every stage of construction are covered. Attention is given to selection of aggregates. Plans and bills of material are shown for a semi-portable gravel washing plant. Reinforcing of various types is discussed and tables of quantities of materials are given for building and paving work. The handbook costs $1.00.

APPLIANCES AND MATERIALS

A Correction

In the description of "Bloxonend" published last week in this column, the sentence which should have read "The blocks are made up in sections about 8 ft. long" was printed "8 in. long," owing to a typographical error.